**Appendices Teaching and Examination Regulations 2020-2021** 

Master's degree programme Nanoscience

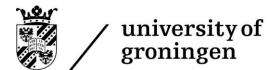
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#### Appendix I

Learning outcomes of the degree programme (art. 3.1)

The graduate of the Top Master Programme in Nanoscience:

- 1. is able to perform nanoscience research in the international and interdisciplinary environment of a world-leading institute
- 2. has the knowledge, skills and attitude that are needed for successful entrance and participation in a PhD programme
- 3. understands the importance of proper scientific conduct and responsible behaviour when performing research, and is aware of the social and ethical ramifications of scientific research and its applications;
- 4. can apply knowledge of those parts of the disciplines of physics, chemistry, and mathematics that are relevant to nanoscience, as well as knowledge of a selection of topics within molecular biology and medicine that are relevant to nanoscience.
- 5. is able to solve realistic scientific problems in the interdisciplinary field of nanoscience, even on the basis of a rudimentary problem specification
- 6. is capable of acquiring sufficient knowledge within a limited time span to work in a different speciality within nanoscience;
- 7. is capable of critically using the scientific literature in his/her chosen speciality;
- 8. is capable of both performing scientific research and of interpreting its results;
- 9. can effectively convey and discuss results of scientific research, orally and in written form, to specialists as well as non-specialists;
- 10. is able to plan and conduct research independently;
- 11. is able to perform research in a research team and work together with fellow students;
- 12.can formulate and defend a realistic and well-argued research plan on the basis of a rudimentary problem specification;
- 13. is able to adapt to the rapid changes occurring in the field of nanoscience;



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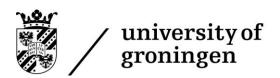
## Appendix II Tracks/Specializations of the degree programme (art. 3.5)

The degree programme is not divided into tracks/specializations.

# Appendix III Content of the degree programme (art. 3.6) Appendix V Entry requirements and compulsory order of examinations (art. 4.4)

Course Unit	Topics	ECTS	Practical	Entry requirement
FIRST VEAR				
FIRST YEAR				
Guided self-study in Nanoscience (WMNS003-06)	Topics from the following list will be assigned on an individual basis on advice from the Admission Board: -Solid-state physics -Quantum theory -Organic chemistry -Inorganic chemistry -Mathematics	6	No	None
CORE-MODULES				
Preparation of Nanomaterials and Devices (WMNS008-10)	-Design of biomimetic materials -Thin-film growth -Preparation of inorganic devices -Preparation of electronic and optoelectronic devices with solution-based techniques -Ordered molecular structures	10	Yes	Guided self- study in Nanoscience*1
Characterization of Nanomaterials and Devices (WMNS009-08)	-Surface and Single Molecule Techniques -X-ray Diffraction -Spectroscopy -Electron Microscopy and Diffraction	8	Yes	Guided self- study in Nanoscience*1
Fundamental and Functional Properties of	-Electronic Structure Properties	11	Yes	Guided self- study in Nanoscience*1

Nanomaterials and	-Surfaces and			
Devices	Interfaces			
(WMNS010-11)	-Electronic Transport			
	Properties of Organic			
	and Hybrid Materials			
	and Devices			
	-Electronic Transport			
	Properties of Inorganic			
	Materials and Devices			
	-Nanomedicine			
	-Optical Properties			
	-Magnetic Properties			
	-TV-lectures in			
	collaboration with			
	Osaka University			
INDIVIDUALLY				
SUPERVISED				
PROJECTS				
Review paper*2	Including workshops	6	No	Guided self-
(WMNS011-06)	academic skills:			study in
	-literature search			Nanoscience
	-scientific writing			
	-ethics and scientific			
	integrity			
Small research	Including workshops	13	Yes	Guided self-
project and	academic skills:			study in
symposium*2	-lab-journal keeping			Nanoscience
(WMNS007-13)	-oral presentation			
	skills			
	-organization scientific			
	symposium			
SECOND YEAR				
JECOND TEAN				
PhD research	Including workshops	6	No	Review paper,
proposal	academic skills:	_	-	Small research
(WMNS012-06)	-writing and			project and
,	presenting proposal			symposium
				and maximal
				one resit for
				one part of the
				core modules.



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Master Thesis*2	Including workshops	45	Yes	Review paper,
(WMNS901-45)	academic skills:			Small research
	-planning and time-			project and
	management of a			symposium
	research project			and maximal
	- Zernike colloquia			one resit for
	- Zernike workshops			one part of the
				core modules.

<sup>\*1:</sup> The Guided Self-study has to be completed prior to participating in the remainder of the programme. Students must participate in the first-offered partial exams on their tasks in the Guided self-study before the first lectures in the Core Curriculum. When a re-exam is needed for passing a part of the Guided self-study, the re-exam must be held and passed before the first partial exams of the Core Curriculum.

## \*2: Note on having sufficient diversity in the topics of the individually supervised projects, and the choice of electives:

The review paper, the small research project and the Master thesis project cannot be on the same topic nor in the same research group. The three topics must be a diverse choice from the research topics that are present in the Zernike Institute National Research Centre (incl. associate members). The choice of electives (see Appendix IV) must support the choice of topics for the individually supervised projects, in particular the Master thesis project.

The choice of the topics and electives requires consultation with the mentor. Whether the choices of a student meet the criteria must be assessed and approved by the Board of Examiners. Exceptions are only possible with clarified motivation and explicit written approval from the Board of Examiners.



#### **Appendix IV Electives (art. 3.7)**

#### Electives from other master degree programmes

The student will spend at least 15 ECTS on electives, on topics related to nanoscience but not sufficiently covered by the Core Curriculum. These electives are taken from master programmes at the University of Groningen in directly related disciplines (typically, but not limited to, the regular master programs in physics and chemistry). The Board of Examiners may permit the student to select one or more course units from a wider range of programmes (from the University of Groningen or from another university).

#### List of approved electives

#### Electives master programme Chemistry/Chemical Engineering:

Advanced product engineering

Advances in Chemical Biology

**Chemical Catalysis** 

Computational Chemistry

Engineered nanomaterials for industry

Interfacial engineering

Molecular quantum mechanics 2

Organic synthesis: methods and strategy 1

Organic synthesis: methods and strategy 2

Organometallic chemistry

Physical methods for chemical analysis

Polymer physics

Polymer products

**Reaction Mechanisms** 

Stereochemistry

Structure determination with spectroscopic methods

Supramolecular chemistry

Synthetic Biology and Systems Chemistry

#### Electives master programme (Applied) Physics:

**Advanced Quantum Mechanics** 

Computational physics

Introduction to plasma physics

Lie Groups in Physics

Many-particle systems

Mathematical methods of physics

Mesoscopic physics

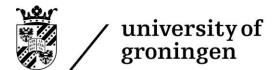
Micromechanics

Non-linear optics

Physics of lasers

Quantum field theory

Statistical mechanics



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Statistical methods in physics Theoretical condensed matter physics Ultrafast time-resolved spectroscopy

<u>Electives other master degree programmes FSE:</u> Advanced Protein Crystallography

Biomaterials 2 MEMS, NEMS and Nanofabrication Statistical signal processing

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#### Appendix VI Admission to the degree programme (art. 2.1.B)

Additional selection criteria, next to the entry requirements in article 2.1.A and 2.2.

- 1. The additional admission requirements comprise:
  - a bachelor's degree in chemistry, (applied) physics, materials science, or other field deemed relevant by the Admissions Board;
  - sufficient knowledge of the relevant sciences;
  - a suitable attitude, motivation and talent to follow the programme.
- 2. Students apply to the admission procedure by submitting the following documents:
  - a complete curriculum vitae;
  - a survey of the study results attained in academic courses so far;
  - a letter in which the student states why (s)he wants to follow this programme in particular, what her/his expectations and ambitions are;
  - (if desired) results of former research projects, like reports or articles;
  - two or three letters of recommendation from scientists or academic lecturers who are also willing to provide personal information on the applicant;
  - (if desired) other documents that the student thinks are useful in furthering his/her application.

These documents are to be sent to the University of Groningen in a manner that is specified on the webpages associated with the programme, by the specified deadline, preceding the start of the programme.

- 3. The Admissions Board judges the student's fulfilment of the requirements. Part of the judgment is an interview with a scientific presentation.
- 4.Students who meet the requirements are provided with an admission letter by the Admission Board.

Students in possession of an admission letter can be admitted to the programme. An admission letter is only valid for the academic year following the academic year in which the letter is granted.

There may be other conditions attached to the admission letter. The requirements must be met before the programme has started.

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## Appendix VII Transitional provisions (art. 7.1)

Not applicable.

### **Appendix VIII**

## Application deadlines for admission (art. 2.6.1) Starting date 1 September 2021

Deadline of Application	Non-EU students EU students
Nanoscience	February 1st May 1st 2021
	2021

### Decision deadlines (art. 2.6.3)

Deadline of Decision	Non-EU students	EU students
Nanoscience	June 1 <sup>st</sup> 2021	June 1st 2021