



Appendices to the Teaching and Examination Regulations

2021-2022

Master's degree programme in Nanoscience

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Appendix I

Learning outcomes of the degree programme MSc Nanoscience (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;



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. 3.7) &
 Appendix V Entry requirements and compulsory order of
 examinations (art. 4.4)**

| Course Unit | Topics | ECTS | Practical | Entry requirement |
|---|--|------|-----------|--|
| 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 solution processable devices -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 Nanomaterials and Devices (WMNS010-11) | -Electronic Structure Properties -Surfaces and Interfaces -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 | 11 | Yes | Guided self-study in Nanoscience*1 |
| INDIVIDUALLY SUPERVISED PROJECTS | | | | |
| Review paper*2 (WMNS011-06) | Including workshops academic skills: -literature search -scientific writing -ethics and scientific integrity | 6 | No | Guided self-study in Nanoscience |
| Small research project and symposium*2 (WMNS007-13) | Including workshops academic skills: -lab-journal keeping -oral presentation skills -organization scientific symposium | 13 | Yes | Guided self-study in Nanoscience |
| SECOND YEAR | | | | |
| PhD research proposal (WMNS012-06) | Including workshops academic skills: - writing and presenting proposal | 6 | No | Review paper, Small research project and symposium and maximal one resit for one part of the core modules. |



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

***1:** 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. 3.8.1)

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
Memristive Devices
Mesoscopic physics
Micromechanics
Neuromorphic Circuit Design
Non-linear optics
Physics of lasers
Quantum field theory
Statistical mechanics
Statistical methods in physics
Theoretical condensed matter physics
Ultrafast time-resolved spectroscopy

Electives other master degree programmes FSE:

Advanced Protein Crystallography
Biomaterials 2
MEMS, NEMS and Nanofabrication
Statistical signal processing



Appendix VI Admission to the degree programme (art. 2.1A.1 + 2.1B.1)

1. The additional admission requirements comprise:

- a bachelor's degree in chemistry, (applied) physics, materials science, or another 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.



Appendix VII Transitional provisions (art. 7.1)

Transitional provision for the Master degree programme Nanoscience (cohort 2019 and earlier)

The package of the three coremodules in the old curriculum

- NS001 Preparation of Nanomaterials and Devices – 8 ECTS credits
- NS002 Characterization of Nanomaterials and Devices – 9 ECTS credits
- NS003A Fundamental and Functional Properties of Nanomaterials and Devices – 13 ECTS credits

has been replaced by the following package of three coremodules:

- NS008-10 Preparation of Nanomaterials and Devices – 10 ECTS credits
- NS009-08 Characterization of Nanomaterials and Devices – 8 ECTS credits
- NS00010-11 Fundamental and Functional Properties of Nanomaterials and Devices – 11 ECTS credits



Appendix VIII Additional Requirements Open degree Programmes (Art. 5.6)

“In exceptional circumstances students wishing to pursue an open degree programme may file a request with the Board of Examiners. The Board of Examiners will evaluate whether the proposed curriculum meets the learning outcomes of the degree programme and can determine further conditions in their rules and regulations.”



Appendix IX Application deadlines

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

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

Decision deadlines (art. 2.6.3)

| Deadline of Decision | Non-EU students | EU students |
|-----------------------------|---------------------------|--------------------|
| Nanoscience | June 1 st 2021 | June 1st 2021 |