university of groningen / faculty of mathematics and natural sciences

Appendices Teaching and Examination Regulations 2015-2016

Master's degree programme Nanoscience

Version of April 16th 2015

Appendix I
Learning outcomes of the degree programme (art. 1.3)

The graduate of the Top Master Programme in Nanoscience:

1. has recent and profound knowledge of those parts of the disciplines of physics, chemistry, and mathematics that are relevant to nanoscience, and has also knowledge of a selection of topics of molecular biology and medicine that are relevant to nanoscience.
2. is able to apply this knowledge to solving realistic scientific problems in nanoscience, even on the basis of a rudimentary problem specification;
3. is capable of acquiring within a limited time span sufficient knowledge to work successfully in a different speciality within nanoscience;
4. is capable of critically using the scientific literature in his/her chosen speciality;
5. is capable of performing scientific experiments and of interpreting their results;
6. can effectively convey results of scientific research, orally and in written form, to specialists as well as non-specialists;
7. is capable of working independently;
8. can co-operate successfully in a research team;
9. can formulate and defend a realistic and well-argued research plan on the basis of a rudimentary problem specification;
10. is aware of the social and ethical ramifications of scientific research and its applications;
11. is able to adapt to the rapid changes occurring in the field of nanoscience;
12. has the motivation, knowledge and skills to successfully enter a PhD programme in any of the world's leading research institutes in nanoscience.

Appendix II Specializations of the degree programme (art. 2.2)

The degree programme is not divided into specializations.

Appendix III Content of the degree programme (art. 2.3)

The compulsory part of the Top Master Programme in Nanoscience consists of:

a. **Guided self-study** (NS000, 6 ECTS) intended to enable students to follow the Core Curriculum. Topics from the following list will be assigned on an individual basis by the Chair of the Board of Examiners:
   - Solid-state physics
   - Quantum theory
   - Organic chemistry
   - Inorganic chemistry
   - Mathematics

For each assigned topic, the tutor associated with the topic will determine in a written or oral exam whether the student has passed the requirements.

The Core Curriculum defines to a large extent the character of the Programme. It consist of the following three modules:

b. **Preparation of nanomaterials and devices**
   (Ns001, core module, 8 ECTS)
   This module consists of several parts. Each part will be examined in written or oral form with one, two or three parts per examination event, and/or via a practical with a written report.
c. **Characterization of nanomaterials**
   (Ns002, core module, 9 ECTS)
   This module consists of several parts. Each part will be examined in written or oral form with one, two or three parts per examination event, and/or via a practical with a written report.
d. **Fundamental and functional properties of nanomaterials**
   (Ns003A, core module, 13 ECTS)
   This module consists of several parts. Each part will be examined in written or oral form with one, two or three parts per examination event, and/or via a practical with a written report. This module includes TV lectures in collaboration with Osaka University, for which attendance is obligatory.

e. **Research paper, incl. lessons on Ethics and Scientific integrity**
   (NS190, 6 ECTS)

The student will write a scientific paper on a topic of his or her choice. This choice needs the approval of the mentor and of the coordinator of this component of the programme. The component is supervised by the mentor or another examiner of the programme. The supervisor and the coordinator of this component will also jointly determine the mark obtained. If requested to, and approved by the coordinator of this component before writing the paper, a students can work with an external supervisor when this ensures good supervision for the topic of the paper.
For the lessons on Ethics and Scientific integrity attendance and in-class participation in the case studies is obligatory.

f. **Small research project** (NS194, 13 ECTS)

The student will carry out a small research project around an already defined problem. All students of a given cohort will jointly organize a symposium in which they will

present their individual small research projects. The supervisor of the project and the coordinator of this component of the curriculum will jointly determine the mark obtained.

g. **PhD research proposal** (NS202, 6 ECTS)
The student will write a proposal for a PhD project, in the form required by Dutch funding agencies like FOM. It is not necessary that the student actually intends to carry out this project himself or herself. The component is supervised by an examiner of the programme. The supervisor and the coordinator of this component will jointly determine the mark obtained. If requested to, and approved by the coordinator of this component before writing the proposal, a students can work with an external supervisor when this ensures good supervision given the topic of the proposal.

h. **MSc thesis project** (NS200, 45 ECTS)
The student will carry out a substantial research project. This is the final degree project.

The small research project (sub f) and the MSc thesis project (sub h) cannot be carried out in the same research group.
The small research project (sub f), the MSc thesis project (sub h), and the research paper (sub e) cannot be on the same topic nor supervised by the same person.

Course unit name	ECTS	Practical	Entry require-ments	Mode of assessment
NS000 Guided self-study	6	No		ST or MT
NS001 Core module preparation	8	Yes	NS000	ST or MT, PR, ATT
NS002 Core module characterization	9	Yes	NS000	ST or MT, PR, ATT
NS003a Core module properties	13	Yes	NS000	ST or MT, PR, ATT
NS190 Research paper	6	No	NS000	Opdr, ATT
NS194 Small research project	13	Yes	NS000	Opdr
NS200 MSc thesis project	45	Yes	NS000	Opdr
NS202 PhD research proposal	6	No	NS000	Opdr
Electives	14		NS000	

The following types of assessments are distinguished by FWN:

- Written exam with open questions (ST)
- Written exam with multiple-choice questions (ST-MC)
- Oral exam (MT)
- Report and/or presentation relating to an assignment (Opdr)
- Interim indicator test (TT)
- Assessment of homework assignments (HW)
- Assessment of practical assignment (PR)
- Other assessment mode to be specified (ALT)
- Mandatory Attendence (Att)

Appendix IV Electives (art. 2.4)

Electives from other master programmes
The student will spend at least 14 ECTS on electives, on topics related to nanoscience but not sufficiently covered by the Core Curriculum. The choice of electives requires consultation with the mentor and approval by the Board of Examiners. These electives are taken from the regular physics and chemistry curricula; the examination method is determined by the Board of Examiners of these curricula. The study load in ECTS is determined by the Board of Examiners of the Top Master Programme in Nanoscience, and is normally about 20% lower than that in the regular physics and chemistry curricula.

The Board of Examiners may permit the student to select one or more course units from another master's degree programme (from the University of Groningen or from another university). In such case, the Board of Examiners will determine the study load on ECTS of the course units.

A selection of recommended electives (with ECTS) are in the list below. Up-to-date information on the electives is presented on the website (online study guide) of the Programme.

For information on the electives see the teaching and examination regulations of the corresponding programme.

Course unit name	ECTS	Practical	Entry require-ments
Advanced product engineering	4		
Advanced Quantum Mechanics	4		
Advances in Chemical Biology	4		
Biomaterials 2	4		
Colloid and Interface Science	4		
Computational physics	3		
Computational Quantum Chemistry	4		
Introduction to plasma physics	4		
Many-particle systems	4		
Mathematical methods of physics	4		
Mesoscopic physics	4		
Micromechanics	4		
Modern laser microscopy	4		
Molecular quantum mechanics 1	4		
Molecular quantum mechanics 2	4		
Nanochemistry	3		
Non-linear optics	4		

Organic synthesis: methods and strategy 1	4		
Organic synthesis: methods and strategy 2	4		
Organometallic chemistry	4		
Physical methods for chemical analyses	4		
Physics of lasers	4		
Polymer physics	4		
Polymer products	4		
Quantum field theory	4		
Reaction Mechanisms	4		
Statistical methods in physics	4		
Statistical signal processing (Msc)	4		
Stereochemistry (15/16)	4		
Structure determination with spectroscopic methods	4		
Supramolecular chemistry	4		
Surfaces and Interfaces	3		
Theoretical condensed matter physics	4		
Ultrafast time-resolved spectroscopy	4		

Appendix V Entry requirements and compulsory order of examinations (art. 3.3)

The Guided Self-study has to be completed prior to the start of the Core Curriculum. See Appendix III.

Appendix VI Admission to the degree programme (art. 4.1.1)

1. Students in possession of an admission permit can be admitted to the programme.

2. Students who meet the requirements are provided with an admission permit by the Admission Board.

3. An admission permit is only valid for the academic year following the academic year in which the permit is granted.

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

5. The admission requirements comprise:
- a bachelor's degree in chemistry, physics, materials science, or other field deemed relevant by the Admissions Board;
- sufficient knowledge of the English language;
- sufficient knowledge of the relevant sciences;
- a suitable attitude, motivation and talent to follow the programme.

6. The Board of Examiners establishes an Admissions Board that judges the student's fulfilment of the requirements. This Board consists of examiners of the programme, completed by a university employee. One of the members is appointed as chairperson.

7. The decisions of the Admissions Board can be appealed to at the Board of Appeal for Examinations.

8. Students apply to the admission procedure by sending in 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 his/her expectations and ambitions are;
- (if desired) results of former research projects, like reports or articles;
- two or three letters of recommendation from scientists who are also willing to provide personal information on the applicant;
- (if desired) other documents that the student thinks useful in furthering his/her application.

These documents are to be sent to the Faculty of Mathematics and Natural Sciences by the specified deadline, preceding the start of the programme.

Appendix VII

Application deadlines for admission (art. 4.6.1)

Deadline of Application	Non-EU students	EU students
Nanoscience	February 1st 2016	February 1st 2016

Decision deadlines (art. 4.6.3)

Deadline of Decision	Non-EU students	EU students
Nanoscience	June 1st 2016	June 1st 2016