Implementation Regulation for the MSc Programme Nanobiology

Part of the Course and Exam Regulation of the Master Programme
As referred to in Section 2 of the Course and Exam Regulation.

Faculty of Medicine (Erasmus MC) of
the Erasmus University Rotterdam

and

Faculty of Applied Sciences of
Technical University Delft

2019-2020

Contents

Section 1 PROGRAMME COMPOSITION

The programme Nanobiology is a two-year master programme and comprises 120 EC.
Courses that form part of the students bachelor programme cannot be part of the master programme.

Article 1.1 Composition of the fisrt year; 2015-2016

First year Master Nanobiology Academic year 2015-2016		
Course	Code	EC
Mathematics for Nanobiology	NB4010	6
High-Resolution Imaging	NB4020	4
Engineering Genetic Information	NB4030	3
Biology of Cancer	NB4040	4
Computational Modeling and Dynamic Systems	NB4050	3
Internship	NB4060	18

Article 1.2 Composition of the first year 2016-2017

There are no changes in the composition of the mandatory part of the program compared to last academic year 2015-2016.

Article 1.3 Composition of the first year 2017-2018

There are no changes in the composition of the mandatory part of the program compared to last academic year 2016-2017.

Article 1.4 Composition of the first year 2018-2019

There are no changes in the composition of the mandatory part of the program compared to last academic year 2017-2018.

Article 1.5 Composition of the first year 2019-2020

Changes in the composition of the mandatory part of the program compared to last academic year 2018-2019: addition of 6EC course Soft matter physics

Addition first year Master Nanobiology Academic year 2019-2020		
Course	Code	EC
Soft Matter Physics	NB4070	6

Article 2.1 Composition of the second year; 2016-2017

Second year Master Nanobiology Academic year 2016-2017		
Course	Code	EC
Master End Project Nanobiology	NB5900	44
Seminars	NB5010	4
Literature Review Report	NB5020	4
Project proposal writing	NB5030	2
Research presentation	NB5040	2

Article 2.2 Composition of the second year; 2017-2018

There are no changes in the composition of the mandatory part of the program compared to last academic year 2016-2017.

Article 2.3 Composition of the second year; 2018-2019

There are no changes in the composition of the mandatory part of the program compared to last academic year 2017-2018.

Article 2.4 Composition of the second year; 2019-2020

Change in the composition of the mandatory part of the program compared to last academic year 2018-2019. The Seminar course will be reduced from 4EC to 2EC, the new code for this course will be:

MSc Nanobiology year 2018-2019			**MSc Nanobiology year 2019-2020**		
Course	Code	EC	course	code	EC
Seminars	NB5010	4	Seminars	t.b.d.	2

Article 3 Elective courses

In addition to the mandatory courses in the first and second year, students should earn at least 22 credits worth of elective courses. In practice this means that the students take five (sometimes six) elective courses from the list below.

Some of the electives are designed especially for Nanobiology students (and will be open to other (physics) students as well). Other electives are drawn from courses already offered at TU Delft or Erasmus MC.

One elective is entirely free and can also be taken at a different faculty or university. The elective should be of the right (Masters) level and should not exceed 6EC, therefore the elective should be approved by the board of examiners.

Students may also propose their own combination of electives, this is subject to approval by the Board of Examiners.

Course code	Course name	ECTS
AP3162	Physics of biological systems: mathematical moddeling in systems biology	6
4403THBPH	Theoretical Biophysics (Leiden University)	6
AP3021	Advanced statistical mechanics	6
AP3032	Continuum Physics	6
AP3122	Advanced Optical Imaging	6
AP3232	Medical Imaging Signals and Systems	6
AP3371	Radiological Health Physics	6
AP3461	The origins of life	6
AP3582	Medical Physics of Photon and Proton Therapy	6
AP3691NB	Evolution and engineering of living systems	6
BM41035	Biomaterials	4
BM41090	Computational Mechanics of Tissues and Cells	6
BM41155	3D Printing	4
CH3142	Molecular Thermodynamics	6
CH3372a	Soft matter for chemical products	3
CH3681a	Reactors and Kinetics	6
IN4086-14	Data Visualization	6
LM3311	Green chemistry and sustainable technology	3
LM3433	Analysis of metabolic networks	6
LM3442	Metabolic reprogramming	6
LM3452	Bioprocess Integration	6
LM3512NB	Systems biology	6
LM3561	Ethical, Legal and Social Issues in Biotechnology	3
LM3601	Molecular biotechnology and genomics	6
LM3611	Microbial community engineering	6
LM3701	Advanced Enzymology	6
LM3741	Environmental biotechnology + Fermentation techniques	6
LM3751	Transport & Separation	6
LM3761	Numerical methods, modeling & Simulation Techniques	6
LM3771	Protein Engineering	6
ME45025	Introduction to Multiphase Flow	6
ME45042-45043	Advanced Fluid Dynamics (AP)	5
ME46000	Nonlinear Mechanics	4
NB4080	Protein quality control mechanisms	3
NB4090	Stem cells	
NB4100	Nuclear architecture	3
NB4110	Geometry of Physics	6

NB4120	Biological Networks; a data driven approach to discover and understanding	3
WI4011-17	Computational fluid dynamics	6
WI4014TU	Numerical Analysis	6
WI4019	Non-Linear Differential Equations	6
WI4201	Scientific computing	6
WI4204	Advanced Modeling	6
WI4212	Advanced Numerical Methods	6
WI4430	Martingales, Brownian Motion, and Stochastic Processes	6

Section 2 Intended learning outcomes MSc Nanobiology

Article 4.1 Knowledge

1. The student has theoretical and practical knowledge of the physics of biological processes and the methods to observe them.
2. The student is able to build mathematical models of physical and biological systems, and can solve them numerically and/or analytically.
3. The student can apply his knowledge to quantify biological processes from experimental results.

Article 4.2 Research skills

4. The student is able to formulate a relevant problem and translate this into a research question.
5. The student is able to conduct elaborate literature investigations, related to the research question.
6. The student is able to translate a research question into a research proposal.
7. In collaboration with other research group members, the student is able to set up and conduct a research project, collect data, analyze data, and come to conclusions.

Aarticle 4.3 Communication skills

8. The student is able to write down research findings in the form of a draft manuscript, which in collaboration with a research supervisor may be developed into a scientific article, suitable for publication in an international, peer-reviewed journal.
9. The student can communicate his or her results in oral and written form to audiences of specialists and non-specialists.

Section 3 ADMISSIONS

Article 5.1 Admission and application Dutch University Bsc degree

The master's degree program is accessible to students without further requirements after completion of their bachelor's degree in Nanobiology.
Students holding a BSc degree in biophysics or molecular biological sciences such a BSc degree in Medical Natural Science (VU), Life Science and Technology (UL/TUD), or Molecular Life Sciences (WUR / Radboud) can be admitted, but will be required to take additional courses (partially possible within the Master program) to compensate for deficiencies in mathematics, physics or biology related topics. This may be a standard program or it may be tailored to the students' specific situation in consultation with the Master coordinator and Admission Committee.

Article 5.2 Admission and application international applicants

Applicants from international institutions seeking admission to the MSc program in Nanobiology must in most cases possess a Bachelor of Science degree in either biophysics or biomolecular related sciences. Their application will require evaluation by the Admission Committee, based upon academic scores and an interview. Perceived deficiencies will need to be addressed by taking appropriate courses in mathematics, physics or biology related topicin their home country.

Article 5.3 Admission and application Dutch University of Applied Sciences (HBO)

Since there is no Bachelor's degree from a university of applied sciences in the field of Nanobiology, a Bachelor's degree from a university of applied sciences does not automatically qualify you for direct admission to the Master's degree programme in Nanobiology.
The Bachelor's degree in applied sciences must have been completed within the nominal duration of the programme, with a grade-weighted average of 75% for all study components. In addition, a supplementary programme consisting of selected courses from the Bachelor's degree programme in Nanobiology is required.

Remediation of deficiencies.
The Master's degree programme in Nanobiology is a multidisciplinary programme with mathematics, physics and biology as core subjects. In order to start the Master's degree programme in Nanobiology, you will first need to complete a supplementary programme in order to bring your knowledge to the required level for each of these subjects. Due to the multidisciplinarity of the programme we require a solid background in university mathematics (calculus, linear algebra and differential equations), physics and molecular biology.

The supplementary programme (or bridging programme) for the MSc programme is always customised, and can be completed after your studies at the university of applied sciences. Most customised bridging programmes for students with a Bachelor's degree in applied sciences will take approximately 2 years to complete. If you have any questions, please send an email to Info-MSc-NB@tudelft.nl

Entrance examinations in Mathematics and English must be taken before the start of the programme (or the bridging programme). For additional details, see www.hbodoorstroom.tudelft.nl and www.tudelft.studielink.nl

Section 4 Examinations

Article 6 Order of the exams

Retake examinations are planned in the 10th week after the regular exam

Article 6.1 Graduation Project, Master's thesis

You may start your Master Thesis Project if you:

- have been admitted to the master programme Nanobiology,
- have passed bridging/homologation modules or other obligations from the bachelor programme,
- have passed 80% of the mandatory courses from the first year
- have made a project plan with your thesis supervisor; this project plan should be handed in at enrollment.

At the start of the final project, the appropriate registration form (MEP application form) must be filled in and handed in at the thesis project office.
The date and time of the master project presentation is determined by the thesis supervisor, after hearing the student. In exceptional cases, the programme director may be involved in setting this date and time.
Further rules governing the MSc graduation projects can be found in article 20 to 25 of the Rules and Guidelines of the Board of Examiners

Article 7 The form of the examinations and the methods of assessment

The form of the examinations and the methods of assessment are described in the (digital) study guide.

Section 5 Special programmes

Article 8 Bridging programmes

Bridging modules must be completed before a student can be admitted in the Master programme; homologation modules can be done as part of the Master. The bridging and/or homologation programmes are listed below. The final decision about a bridging or homologation programme, also in other cases, is made on an individual basis.
Students can be admitted to the Master programme if the extent of their deficiencies is limited to a maximum of 9 credits. If deficiencies extend this size, students can only be admitted to the bridging programme. Students can then be admitted in the master programme if all remaining deficiencies can be incorporated in the master programme. The remaining modules become part of the master programme. Completion of the bridging programme by students formally admitted to it guarantees admission to the Master programme.

Article 8.1 Required bridging/homologation courses for TU Delft BSc Life Science and Technology

Course	Code	credit
Analysis 3	WI1416NB	3
Linear Algebra	WI1142NB	3
Differential equations	NB2061	3
Electronic Instrumentation	NB2211-14	6
Physics 2	NB2141	3
Signals and Systems	TN2545	6
Optics & Microscopy	NB2041	3
Statistical Physics	TN2624NB	3

Computational science	TN2513	3
Image Analysis	NB2121	3
Nanotechnology	NB2081	2

Article 8.2 Required bridging/homologation courses for TU Delft BSc Applied Physics

Course	Code	credit
Chemistry-1	NB1102	3
Chemistry-2	NB1110	3
Biochemistry	NB1012	3
Molecular Biology	NB1016	3
Genetics	NB1022	4
Physical Biology of the Cell-1	NB1072	3
Biophysics	NB1132	3
Physical Biology of the Cell-2	NB2071	3
Evolutionary Developmental Biology Part 1&2	NB2032	6
Bioinformatics	NB2161	4.5
Image Analysis	NB2121	3

Article 9 Honours programme

The Honours Programme consists of at least 20 EC on top of the regular master programme of 120 EC. The full Nanobiology programme including the additional honours track should be finished according to schedule. It is an individual programme that contains a 5 EC specially developed course for all TU Delft honours track students plus a coherent package of at least 15 ec of challenging course modules or projects composed by the student.

Collective Part (5 EC) UD2010, Critical Reflection on Technology, 5EC, obligatory
Individual Part (15 EC) **Possibilities:** AS1011HPM, Applied Sciences Company Project, 12EC AS1021HPM, Applied Sciences Honours Classes, 3EC AS1031HPM, Applied Sciences Research Project, 9-15EC

Section 6 Additional Rules

Article 10 Transition rules

Per academic year 2016-2017, elective courses are not divided in different categories. Student can choose any elective from the proposed list in article 3. In retrospect this also counts for the students from cohort 2015.

Per academic year 2019-2020:

- Soft matter physics (NB4070) will be a mandatory course for all students starting the master Nanobiology programe in September 2019 and later.
- The Seminars course (NB5010, new course code to be determined) will become a 2EC course for all students starting the master Nanobiology programme in September 2019 and later.

Article 11 Degree supplement

An overview of the study modules taken, is given on the certificate. The degree supplement is issued in English

Article 12 Date of commencement

These regulations will come into effect on 1 September 2019.