Master Nanobiology

MSc Programme

Are you intrigued by the complexity of living systems? How do cellular and molecular processes function in health and disease? Can they be quantified, modeled, predicted, and modified? If you want to find answers to these types of questions the Master Nanobiology is for you. We are going on an exploratory journey to see if and how some of these questions can be addressed using the principles of physics.

Degree	Master of Science
Starts	September / February*
Type	Full-time
Credits	120 ECTS, 24 months
Language	English
Application deadline	1 April 2019
Kosten	€ 18.750 (non EU) € 2.083 (EU)
Scholarships	scholarships.tudelft.nl

* only for Dutch students

In the field of Life Sciences, biology and physics are converging. Traditionally, the level of the cell is the domain of biologists and medical researchers. However, physical processes are at work as well on the cell level. Knowledge of physics (on the nano scale) is essential for a good understanding of these processes, knowledge that biologists and medical researchers typically do not possess. Alternatively, physicists are not acquainted with the behaviour of cells and as a result are not able to interpret physical processes in the cell. To be able to understand the molecular basis of health and disease, knowledge of both physics and (molecular) biology is essential. Nanobiology is the discipline where biology, specifically the basic biology of human health and disease, and nanophysics meet.

Programme

The Nanobiology programme of TU Delft and Erasmus MC builds on extensive existing bottom up research collaborations and cooperative mission organizations like Medical Delta. The molecular building blocks of living organisms are the focus and current advances in the nanotechnology toolkit enable the precise visualization, study and control

TU Delft

Erasmus

Master Nanobiology

<table>
<tr><th colspan="3">FIRST YEAR</th></tr>
<tr><th colspan="2">FIRST SEMESTER</th><th>SECOND SEMESTER</th></tr>
<tr><td colspan="2">MATHS FOR NB (6 EC)</td><td rowspan="3">INTERNSHIPS (18 EC)</td></tr>
<tr><td>COMPUTATIONAL MODELING AND DYNAMIC SYSTEMS (3 EC)</td><td>BIOLOGY OF CANCER (4 EC)</td></tr>
<tr><td>HIGH RESOLUTION IMAGING (4 EC)</td><td>ENGINEERING GENETIC INFORMATION (3 EC)</td></tr>
<tr><td colspan="2">ELECTIVES (10 EC)</td><td>ELECTIVES (12 EC)</td></tr>
<tr><th colspan="3">SECOND YEAR</th></tr>
<tr><th colspan="2">FIRST SEMESTER</th><th>SECOND SEMESTER</th></tr>
<tr><td colspan="3">RESEARCH PROJECT (44 EC)</td></tr>
<tr><td colspan="2">PROJECT PROPOSAL WRITING (2 EC)</td><td>PROJECT PROPOSAL WRITING (2 EC)</td></tr>
<tr><td colspan="3">SEMINARS (4 EC)</td></tr>
<tr><td colspan="3">LITERATURE REVIEW PROJECT (4 EC)</td></tr>
<tr><td colspan="3">ELECTIVES</td></tr>
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of these biological molecules. Developments in biomedicine, such as studies on human genome variation and the control of stem cells, increasingly require analysis and quantitative description at the fundamental level. Furthermore, it is becoming possible to use the elements of the cell to develop artificial biomolecules and nanoparticles with wide applications in research and medicine. The incorporation of new biological building blocks is highly promising for instance in industrial biotechnology and medical science. These advances will reshape many aspects of medical diagnosis and treatment. The rapid advancement of modern biomedical, biophysical and computational technologies promises to provide new tools to gain in depth knowledge of the fundamental molecular and cellular mechanisms controlling health or involved in disease.

The programme is a mixture of more theoretical courses, which deepen and broaden the knowledge and understanding the students have acquired previously during the bachelor's program and practical research in a large research project. The courses continue in the same line as the bachelor courses when it comes to the integration of physics and biology. Where biological challenges for example in the course "biology of cancer" are being approached from a mathematical and physical perspective. Other mandatory courses will focus on microscopy in "high resolution imaging" and modelling of complex systems. Apart from the compulsory courses, there is a large selection possibility from a list of elective courses.

Student profile

Due to the multidisciplinarity of the programme we require a solid background in all three disciplines; university mathematics (calculus, linear algebra and differential equations), physics and molecular biology. For further information about admission and application, please see: www.admissions.tudelft.nl

Career prospects

The career prospects of Nanobiology graduates are excellent. The programme prepares for a career in industry, research organizations and public institutions. Graduates can find jobs in fundamental as well as applied research, for instance in life sciences or pharmaceutical companies or chemical companies. Another type of function would be in the development of nano measuring methods and manufacturing technologies.

Graduation projects

Some examples of recent graduation projects are:

- Hector Tjeda Mora: Probing the mechanical properties of Caco-2 monolayers
- Esmee Adegeest: Probing the mechanical properties of early Tribolium castaneum embryos
- Berkalp Dogander: Nucleic acid-protein interactions
- Bram Verhagen: Probing the mechanical properties of mouse embryonic stem cells
- Ilias Zarguit: DNA programmed liposome deformation with E. coli divisome proteins

30
Students

50%
Male

50%
Female

10%
International students

52th
QS World University Ranking

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