Bachelor's degree programme

Nanobiology

Integrating Physics with Biomedicine

TU Delft
We’ve just begun to explore life on this level

Nanobiology uses the language of mathematics in the context of physics to understand the complexity of biology. The field of Nanobiology is developing fast, bringing changes that will soon have an impact on our society in medicine and beyond. During this degree programme you will cross the boundaries of physics, nanophysics, biology and medical research. You will study at the frontier of an exciting new research field that combines physics and biology.

From developing methods and techniques to identify heart failure before it leads to disease, to developing microscopes that help to analyse vital molecules in living cells: Nanobiology is the study of the complexity of living systems.

The Nanobiology Bachelor’s degree programme teaches the fundamental knowledge and skills needed to describe and study the complexity of living systems. The emphasis of the programme is on learning to apply quantitative analysis based on the principles of physics. These skills and knowledge will bring about changes that will affect our society in the near future, not only in terms of medicine, but also in terms of energy, food and beyond. Studying Nanobiology will enable you to contribute to society by addressing current and future challenges. This Bachelor’s degree programme gives you the best of both worlds, as TU Delft and Erasmus University Rotterdam have joined forces to bring you this unique programme.

The Nanobiology curriculum

The three-year Nanobiology programme is fundamentally interdisciplinary: it gives a thorough grounding in physics and mathematics, focusing on biomedical science and nanoscience. The courses feature lectures, workgroups and combinations of the two. The programme also includes laboratory-based lessons, which provide an opportunity to work with advanced research equipment. You study in small groups at both Erasmus MC in Rotterdam and the faculty of Applied Sciences in Delft. There are many links between the courses that are taught in parallel, with similar examples or other forms of integration. This helps you to place the knowledge you’ve acquired in a wider framework.

Applying nanophysics to complex biological systems. Understanding the biology in a quantitative way as it relates to health and disease.

The first two academic years focus on the acquisition of knowledge, and in the third year you have the chance to apply what you have learned. All courses are taught in English, to prepare you for the international working environment and to allow qualified international students to join our programme.
Year one

Introduction to the field

The first year of Nanobiology will give you a strong foundation in theoretical knowledge and enable you to master basic research skills, laboratory techniques and scientific methods. In the first period you will follow the course on ‘Introduction to studying Nanobiology’, in which you will develop study and group research skills. Over the year you will take courses in cell biology, advanced mathematics, calculus, linear algebra, physics, biophysics, genetics and biochemistry. You will be introduced to computer programming for the simulation of biological systems, which will provide a basis for advanced programming courses.

Year two

In-depth study of the field

In the second year, you apply the fundamentals of mathematics and biology that you acquired in the first year to advanced mathematics, physics and biology. This forms an important step towards the bridge courses taught throughout the programme. Second-year practical courses include Electronic Instrumentation, Microscopy/Nanoscopy practice and Computational Science.

Year three

Elective space and graduation

In your third and final year of the Bachelor’s in Nanobiology, you focus on doing laboratory research while applying all of the knowledge and skills you acquired in the first two years.

‘Nanobiology is a relatively new area of research that crosses the boundaries of physics, nanophysics, biology and medical research’
of study. As part of your studies, you follow a ‘minor’ – a short study project in a scientific field of your choice. In the second half of the third year, you take a selection of elective courses and you start working on your Bachelor’s research project. This entails working in a research group for 20 weeks, conducting research that you design together under the direct guidance of an experienced researcher. The results of your research project form the basis for your Bachelor’s thesis, which is a scientific report on your research findings.

**Do you have what it takes to be a Nanobiology student?**

As a Nanobiology student, you have an inquiring, inquisitive mindset and a strong interest in mathematics, physics and biology. You want to contribute to ground-breaking research in the near future and you are willing to work hard to reach that goal. If you recognise yourself in the following characteristics, then the Bachelor’s in Nanobiology is the programme for you!

- You have a high aptitude for mathematics, physics and biology
- You are a team player.
- You have a good grasp of the English language.
- You would enjoy exploring a new area at the interface of biology, mathematics, physics and technology.
- You want to make a difference to the future of biomedicine.

**Curriculum (indicative)**

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<td>Genetics</td>
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| Introduction to studying Nanobiology | Chemistry 1 | Bio-
| | Chemistry 2 | molecular Dynamics |
| | Labcourse Nanobiology 1 | Labcourse Nanobiology 2 |
| | Analysis 1 | Analysis 2 | Molecular Biology |
| | | | Journal Club |
| | | | Linear Algebra |
| | | | Analysis 3 |
| | | | 1st Year |
| | | | 2nd Year |
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| | | | 4th Year |
| | | | | Minor |
| | | | | Bachelor Thesis project |
| | | | | Elective courses |
| | | | | Mathematics |
| | | | | Biology |
| | | | | Chemistry |
| | | | | Physics |
| | | | | Bridge courses |

For further information on all subjects: www.studyguide.tudelft.nl
After your Bachelor’s in Nanobiology

With a Bachelor’s degree from TU Delft, you have a range of options. You can opt to study for a Master’s degree at the same faculty or at a different faculty, or even at another university within the Netherlands or abroad.

Master’s degree programme Nanobiology

TU Delft (Applied Sciences) and Erasmus University Rotterdam (Erasmus MC) offer a joint Master’s programme in Nanobiology. The Nanobiology programme builds on extensive existing bottom-up research collaborations and partner organisations, such as Medical Delta. The two-year Master’s programme features exciting research and advanced studies, preparing you for a PhD or a job as a scientific researcher in Nanobiology or a related field. Like the Bachelor’s courses, the Master’s courses concern the integration of physics and biology.

Other Master’s degree programmes

A Bachelor’s degree in Nanobiology qualifies you for admission to the research Master’s programmes in Molecular Medicine, Neuroscience and Infection and Immunity at Erasmus MC or Biomedical Engineering at the TU Delft. When combined with a number of supplementary courses, a Bachelor’s degree in Nanobiology can also qualify you for admission to the TU Delft Master’s programmes in Applied Physics, Bioinformatics and others.

Career

Job market profile

You are a trained, multidisciplinary analyst and problem-solver. You can analyse complex problems, such as those that occur in biological systems, and you have the quantitative tools to address these problems. You have a comprehensive skills set that you can apply in Nanobiology research, including Biomedicine, Synthetic Biology, Optics, Biotechnology but also in nanotechnology, agri/food, energy, manufacturing etc. have all expressed interest, either in academia, in a medical institution or in industry.

Career prospects

Following graduation, you can start work outside academia, follow another programme of study or embark on a scientific career. You might choose a position at an industrial
company, a scientific institution or a government agency, where you can use your scientific knowledge to draft and evaluate research proposals and policy plans from national and international research groups. With your ability to shift between the domains of science and technology, you will also have a great foundation for a career as a teacher, science journalist or advisor.

Some examples:

**Research Scientists:**
- In academia: Molecular Medicine, Biophysics (topics such as stem cell and cancer research), Synthetic Biology and Nanoscience
- In business: Scientist/project manager in research and development in companies such as DSM and Philips

**Commerce & Technology:**
- Developer or product specialist in imaging/nanotech instruments
- Software specialist in imaging/data analysis

**Government & Society:**
- Science communication/education
- Science funding and policy organisations
- Editor in scientific and academic publishing

‘In my case, the process of choosing the right Bachelor’s programme went less smoothly than I had anticipated. There were many areas that I liked, but nothing wholly appealed to me. The problem was mainly due to my broad interest in almost all science subjects, which made it difficult to choose one particular field. Fortunately, I soon stumbled upon Nanobiology: a programme in which you get the chance to delve into several different disciplines, with an emphasis on physics, mathematics and biology. This struck me as a worthy challenge.

Now that I’m in my second year of the Bachelor’s programme in Nanobiology, I have found the challenge that I expected! It is certainly not the easiest Bachelor’s programme, but the satisfaction you get when you pass another course is more than worth it.

In addition to the challenge, the pioneering aspect of Nanobiology appeals to me. You work in a dynamic research field and you could be one of the first people to contribute to it. The combination of pioneering science, challenge and much more is what makes Nanobiology so unique.’

Aoibhinn Reddington
2nd year student Nanobiology

‘You get the chance to delve into several different disciplines.’
Come and meet us
Come to one of our events to get in-depth information about the programmes that interest you at TU Delft or Erasmus MC.

Open Days - visit the programmes on campus to find out more.
www.opendagen.tudelft.nl
www.eur.nl/bachelor/opendag

Student for a Day (Meeloopdagen) - be a student for a day and experience what it is like to study in Delft and Rotterdam
www.meeloopdagen.tudelft.nl

Trial Studying Nanobiology
Online Trial Studying enables pupils to experience what it is like to study Nanobiology.
www.proefstuderen.tudelft.nl

Admission requirements
The Bachelor’s programme in Nanobiology welcomes applicants with Dutch vwo diplomas with the following subject clusters:
• N&G profile with Physics & Mathematics B
• N&T profile with Biology
• Any other diploma including the vwo subjects Physics, Mathematics B, Biology and Chemistry
• For information about equivalent international diplomas see: www.admissions.tudelft.nl

Binding recommendation on continuation of studies (BSA)
You must earn at least 45 ECTS (out of the 60) by the end of the first year of study. You will be issued with what is known as a negative binding if this standard is not achieved recommendation on continuation of studies.

This means that you will not be able to enrol for this study programme at TU Delft for the following four years. www.bsa.tudelft.nl

Numerus Clausus
Since the academic year 2017-2018, enrollment is limited based on a selection procedure. The Nanobiology BSc programme has a numerus clausus. The hundred available places will be allocated via a selection procedure. Note that the registration deadline for the Nanobiology selection procedure is earlier than for regular (non-numerus clausus) programmes. More information on the selection procedure can be found on the Nanobiology programme websites:
www.nb.bsc.tudelft.nl/
www.eur.nl/bachelor/opleidingen/nanobiology/

Honours Programme Delft
The Delft Honours Programme is for students who would like an additional challenge and are capable of achieving more than the standard teaching programme. This is in addition to the regular study programme. It gives you the opportunity to acquire additional knowledge in or outside your field of specialisation, to work on your personal development and to collaborate with students from other programmes. www.honours.tudelft.nl

Digital brochures
View other brochures online at:
www.brochures.tudelft.nl

Virtual campus
Curious about our campus?
Take a look at: www.campus.tudelft.nl

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