Postbus 5050
NL-3502 JB Utrecht
+31 30 87 820 87
www.AeQui.nl
info@AeQui.nl

Bachelor Biotechnologie
Master Biotechnology
Master Bioinformatics

Wageningen University

Advisory report of the assessment of the existing programmes
16 and 17 January 2025

Colophon

Institution and programme

Wageningen University
Wageningen
Institutional Audit: yes

Bachelor's programme Biotechnologie (Croho 56841)
Master's programme Biotechnology (Croho 66841)
Master's programme Bioinformatics (Croho 60106)

Wageningen University
Location: Wageningen
Mode: Full-time

Assessment panel

Stanley Brul, chair
Marloes van Dort, expert
Kevin Verstrepen, expert
Olga Kalinina, expert
Koen Wijsman, student member
Linda van der Grijspaarde, secretary

AeQui Nederland
PO Box 5050
3502 JB Utrecht
The Netherlands
www.AeQui.nl

Summary

On 16 and 17 January 2025, the bachelor's programme Biotechnologie, the master's programme Biotechnology and the master's programme Bioinformatics of Wageningen University were assessed. The panel's overall judgement of the three programmes is positive.

Intended learning outcomes

The objective of the bachelor's programme Biotechnologie is to deliver academics who are able to function under supervision in multidisciplinary teams solving problems in the design or handling of biotechnological products and processes, now and in the future.

The main focus of the master's programme Biotechnology is on deepening knowledge and acquiring additional skills to enable graduates to function as academic experts in inter- and multidisciplinary teams working on the design and development of biotechnological products and processes. Unlike the broad introduction to the biotechnological disciplines in the bachelor's programme, the master's programme focuses on expertise in one specific scientific field or application within biotechnology.

The main characteristic of the master's programme Bioinformatics is the application of computer science in the analysis and interpretation of large heterogeneous biological data sets. Originally, bioinformatics was mainly applied in the creation and analysis of databases with high throughput biological information. Today, it is an interdisciplinary field which facilitates data-driven discovery.

The profiles of the bachelor's programme and the master's programmes are translated into sets of 8 to 11 intended learning outcomes. According to the panel, the intended learning outcomes of the three programmes fit the level and orientation of the programmes and are aligned with the expectations of the (international) professional field. There is sufficient differentiation between the intended learning outcomes of the bachelor's programme and those of the master's programme. The latter are clearly formulated at a higher level.

The programmes have good contacts with the professional field. The programmes align their objectives and curricula with the professional field through informal contacts with stakeholders and annual consultations of their External Advisory Committee.

The panel thus concludes that the bachelor's programme Biotechnologie, the master's programme Biotechnology and the master's programme Bioinformatics meet this standard.

Teaching-learning environment

The fulltime bachelors' programme has a duration of three years and comprises a total of 180 EC. The English-language fulltime master's programmes have a duration of two years and comprise a total of 120 EC.

The panel notes that the contents of the three programmes enable students to achieve the intended learning outcomes. The bachelor's programme and the two master's programme's programmes have clearly translated the intended learning outcomes into the educational programmes.

The bachelor's curriculum contains four compulsory study tracks: the chemical track, the mathe-

matics & engineering track, the biological track and the integrative track. During the third year, students can choose a minor or take optional courses. Students also complete a thesis in the third year. The master's programmes come with different elements: a joint part, a specialisation and/or optional courses part, a thesis track, and an internship (or research project).

The didactic concept of the programmes supports the learning process of the students. The educational formats are adequate. The programmes offer a wide variety of study methods, including lectures, tutorials (making assignments under the guidance of a lecturer), practicals (practical assignments in a lab room) and self-study. The average number of contact hours in teaching weeks for the three programmes is 25. The panel is positive about the (high) number of contact hours and the diversity in teaching methods. The programmes have appropriate facilities and matching infrastructure, with well-equipped biotechnology labs.

The programmes have a strong teaching team. The various disciplines are well represented by the input of staff from a variety of research groups, as is practical and scientific experience in the various fields of work, according to the panel.

The admission requirements of both the bachelor's programme and the master's programmes adequately match the programmes.

The panel thus concludes that the bachelor's programme Biotechnologie, the master programme Biotechnology and the master programme Bioinformatics meet this standard.

Student assessment

The programmes have an adequate, solid assessment system and assessment procedures. The system is adequately based on the university-wide policy. Frequently used assessment methods are written tests (open and/or closed questions), assignment (reflection) report, oral presentation, other assignment and performance.

Quality assurance of assessment is ensured by a proactive Examining Board for the programmes. The Board, focusing on a group of programmes, show a sufficient knowledge of the individual programmes and their assessment. In the past years, the capacity of the Board is sufficiently increased.

The panel thus concludes that the bachelor's programme Biotechnologie, the master's programme Biotechnology and the master's programme Bioinformatics meet this standard.

Achieved learning outcomes

Students conclude the bachelor's and master's programmes with a thesis. Some of the intended learning outcomes of the master's programmes are assessed in the internship. Based on reviewing the recent theses of 15 alumni from each programme, the panel finds that the students achieve the intended level of the programmes in the subject area.

Bachelor's graduates have access to subsequent master's programmes for which students have acquired appropriate knowledge and skills. According to the panel, master's programmes prepare students very well for the job market and ensure that students end up in positions that fit the intended exit profiles. Most of the graduates of the master's programmes will work in the industry, academic research, or applied research (research institutes).

The panel thus concludes that the bachelor's programme Biotechnologie, the master's programme Biotechnology and the master's programme Bioinformatics meet this standard.

Suggestions

Looking ahead, the panel offers a number of suggestions for consideration, including the following recommendations:

- Harmonise the assessment forms for the thesis across disciplines and pay attention to giving proper feedback on the forms.
- Implement a stronger central policy around the teachers' and students' use of AI and consider integrating some practical introduction to the efficient, correct and ethical use of different (generative) AI applications.
- Ensure the management of expectations regarding the internship placement and its duration. The programme is challenged to ensure sufficient options for a 4 months internship and should point students timely to the Research Practice as alternative 4 months practical experience.
- For the master's programme in bioinformatics, consider making the Academic Master's Cluster more tailored towards the bioinformatics students by choosing projects appropriate to the programme.

All standards of the NVAO framework have been positively assessed. On this basis, the panel provides a positive recommendation regarding the accreditation of the bachelor's programme Biotechnologie, the master's programme Biotechnology and the master's programme Bioinformatics.

On behalf of the entire site visit panel,
Utrecht, March 2025

Stanley Brul
Chair

Linda van der Grijspaarde
Secretary

Introduction

Profile

Wageningen University & Research is a collaboration between Wageningen University and the Wageningen Research foundation. The domain of Wageningen University & Research consists of three related core areas: Food, feed & bio-obased production, natural resources & living environment and society & well-being. The mission of Wageningen University & Research is 'to explore the potential of nature to improve the quality of life'. Wageningen University & Research has 7,600 employees and 13,100 students.

Wageningen University & Research consists of 1 faculty, 5 departments and 95 chair (research) groups. In total there were 20 bachelor's programmes, 31 master's programme's programmes and 49 Massive Open Online Courses.

Three programmes in the domain of biotechnology are assessed: the bachelor's programme Biotechnologie, the master's programme Biotechnology and the master's programme Bioinformatics.

The two master's programmes are offered in English and use an English title. Ever since the establishment of the bachelor's and master's programme's system, English has been the language of instruction for all master's programmes at Wageningen University and for some internationally oriented bachelor's programmes. This is a condition for a basic principle of education at Wageningen University: the 'international classroom'. The language of English is defined in the Code of Conduct of the Wageningen University. With this policy, Wageningen University not only aims to ensure that students from all over the world can participate in the instruction and share its knowledge; it also aims to endow graduates with a basic skill that will help them to launch their (international) careers. The panel considers the statements for both the master's programmes to be adequate. In this respect, the panel finds it logical that the English-language programmes have also chosen a corresponding English title.

The assessment

Wageningen University has commissioned AeQui to conduct the current assessment. For this purpose, AeQui, in collaboration with the programme, has assembled an independent and knowledgeable panel. A preparatory meeting with representatives of the programme has taken place.

The assessment was conducted based on the Accreditation Framework for Higher Education in the Netherlands, according to the programme outlined in Appendix 2. The institution has a positive institutional audit decision, and therefore four standards were assessed.

Recommendations for further development were made during the previous assessment. The programme has acted in response (see Appendix 3). The panel has integrated this follow-up into its considerations for the current assessment.

The panel conducted the assessment independently; the panel received the necessary information to arrive at a judgement. At the end of the assessment, the programme was informed of the findings and conclusions.

This report was sent in draft to the programme; the programmes responses have been incorporated into this final report.

At the initiative of the programme, a development meeting took place during the visit. The results of this development meeting will not affect the assessment presented in this report.

Name of the master's programme Bioinformatics

Wageningen University intends to change the name of the master's programme Bioinformatics. The proposed new name is: Bioinformatics and Systems Biology. At the time of accreditation, the programme asked the panel to indicate from its expertise whether this name change is appropriate. This chapter presents the programme's rationale for the name change and the panel's response.

Findings

The programme's intention to change its name is based on the following points.

In terms of content, the programme has offered a learning path to both Bioinformatics and Systems Biology for several years. Also, the two compulsory master's courses deal with bioinformatics and systems biology, respectively. Logically, students also find it strange that the name of the master's is 'only for half of the programme'.

Two similar master's programmes in the Netherlands already have a name that includes systems biology. The programme fears losing students to those programmes. Similar master's programmes internationally also use the name MSc Bioinformatics & Systems Biology (e.g. DTU).

Considerations

The panel believes that the proposed name does better justice to the scope of the programme than the current name. This name also is in line with the name of similar programmes at other Dutch and international universities. The panel therefore agrees with the proposed name.

Intended learning outcomes

Standard 1: The intended learning outcomes tie in with the level and orientation of the programme; they are geared to the expectations of the professional field, the discipline, and international requirements.

Findings

For the individual programmes, the profile and intended learning outcomes are described. The link with the professional field is then described for the programmes as a whole.

Bachelor's programme Biotechnologie

The main characteristic of the bachelor's programme is the focus on application-oriented integration of biological disciplines and process engineering. The objective of the programme is to deliver academics who are able to function under supervision in multidisciplinary teams solving problems in the design or handling of biotechnological products and processes, now and in the future.

The profile of the programme is translated into 11 intended learning outcomes. Biotechnology merges biology and engineering. Therefore, the intended learning outcomes of the bachelor's and master's programme in the field of biotechnology are partly based on the European network for Accreditation of Engineering and partly on the Dutch domain specific framework for Biology programmes.

Knowledge and skills on both biotechnological and basic disciplines are covered in the programme learning outcomes 1-3. Development of a biotechnological process requires a multidisciplinary approach. The knowledge and understanding obtained from biological disciplines (biochemistry, microbiology, molecular biology, virology, cellular biology, systems and synthetic biology) as well as process engineering have to be applied. The biotechnological disciplines require knowledge and understanding in basic disciplines such as physical, organic and analytical chemistry, mathematics and statistics.

Graduates must be able to contribute to research and development projects by applying the knowledge and skills of the numerous biotechnological disciplines. This is covered in learning outcomes 4-6.

In addition, biotechnologists need to communicate. They must be able to translate requests from an interested party into ideas. In these discussions, the biotechnologist will also meet social, ethical, economical and legal constraints. This is covered in learning outcomes 7-10.

Reflecting upon personal knowledge, skills, attitudes and functioning, and designing the own learning path is covered in intended learning outcome 11.

Master's programme Biotechnology

The main focus of the master's programme Biotechnology is on deepening knowledge and acquiring additional skills to enable graduates to function as academic experts in inter- and multidisciplinary teams working on the design and development of biotechnological products and processes. Unlike the broad introduction to the biotechnological disciplines in the bachelor's programme, the master's programme focuses on expertise in one specific scientific field or application within biotechnology, depending on

the specialisation chosen by the student. The objective of the programme is to deliver academics who are able to function as experts in multidisciplinary biotechnological product and process design, research and development, now and in the future.

The programme has five specialisations: Cellular/Molecular Biotechnology, Food Biotechnology, Medical Biotechnology, Process Technology, and Environmental and Biobased Technology.

The profile of the programme is translated into 11 intended learning outcomes, partly based on the European network for Accreditation of Engineering and partly on the Dutch domain specific framework for Biology programmes.

Learning outcomes 1 and 2 cover the knowledge and skills of the biotechnological core disciplines and a depth of knowledge and skills in one of those disciplines.

Graduates are able to apply specialised knowledge and skills in biotechnological research and design projects and take responsibility for their own sub-project. This is covered in learning outcomes 2-5.

Graduates function as experts in multidisciplinary teams working interdisciplinary on biotechnology product design or development. They are able to translate requests from an interested party into development and design, co-operate with experts from other biotechnological disciplines and are aware of non-technical constrains. This is covered in learning outcomes 6-10.

The development of an academic attitude for lifelong learning is covered in learning outcome 11.

Master's programme Bioinformatics

The main characteristic of the master's programme Bioinformatics is the application of computer science in the analysis and interpretation of large heterogeneous biological data sets. Originally, bioinformatics was mainly applied in the creation and analysis of databases with high throughput biological information. Today, it is an interdisciplinary field which facilitates data-driven discovery.

Like other life science disciplines, bioinformatics aims to increase the understanding of biological processes. To achieve this goal, the programme teaches students to develop and apply computer science processes and quantitative tools for biological systems. While biology remains the central theme, technological advances have led to the development of a number of high throughput methods that have led to an increase of available biological data.

The programme has two tracks, one specialising in bioinformatics and the second in systems biology. The focus of the first track is on application-oriented integration of biological disciplines with computer science solutions; the second track focuses on integrative approaches and pathway analysis of biosystems.

To summarise, graduates of the programme are able to develop and apply computer science tools to solve multi- and interdisciplinary biological research questions. The profile of the programme is translated into 8 intended learning outcomes, based on the bioinformatics curriculum guideline as published in PLOS Computational Biology, 2014, by Welch *et al.*.

Knowledge and skills in bioinformatics and supporting disciplines are covered by learning outcomes 1, 3 and 4. Data-driven discovery requires a multidisciplinary approach. A computa-

tional analysis starts with recognition of the biological problem and formulation of the biological question. This requires sufficient knowledge and understanding of the domains of (molecular) biology, mathematics, computer science and statistics.

In addition, data-driven discovery requires an interdisciplinary approach, as a bioinformatician needs to communicate with others in different life science fields, must be able to translate requests from interested parties into ideas and co-create solutions to complex problems. In these discussions, a bioinformatician also needs to address social, economic, ethic and legal constraints. This is covered in learning outcomes 5-7.

Working in an interdisciplinary, fast developing field, bioinformatics graduates must be able to function in multi- and interdisciplinary research environments. They have to contribute to research and development projects by applying their knowledge and skills. This is covered in learning outcomes 2 and 7.

Graduates have to be capable of lifelong learning and must be able to design their own learning path. This is covered in learning outcome 8.

Link with the professional field

To match the demands of the field, the programmes maintain formal and informal contacts with potential employers. In addition to the frequent contacts and meetings of staff with representatives of the professional field, there is an External Advisory Committee that meets once a year to discuss the intended learning outcomes, the content and quality of the programme and the performance of graduates.

Consultation sessions of the programme management with the External Advisory Committee, representing the professional field, confirm that the learning outcomes of the three programmes are in line with the requirements of the labour market. For the future, the Committee advised changes needing to adapt to increased automation and optimisation in biotechnology.

Considerations

The panel welcomes the clear, multidisciplinary profile of the bachelor's and master's programmes, integrating the fields of biology, technology and computer science. In the documentation and interviews, the programmes manage to make clear how they differ from related programmes, such as Plant Sciences, for example.

The panel assesses that the intended learning outcomes of the three programmes fit the level and orientation of the programmes and are aligned with the expectations of the (international) professional field. According to the panel, there is sufficient differentiation between the intended learning outcomes of the bachelor's programme and those of the master's programme. The latter are clearly formulated at a higher level. This is especially clear from the intended learning outcomes that specify the academic and research skills that students need to obtain.

The panel appreciates the programme's good contacts with the professional field. The programmes align their objectives and curricula with the professional field through informal contacts with stakeholders and annual consultations of their External Advisory Committee. The panel notes that the programme's good relations with the professional field enable it to continuously monitor current developments and incorporate them into the programme's profile and programme.

Regarding the bachelor's programme Biotechnologie, the panel notes the following. The intended learning outcomes are in line with the profile of the bachelor's programme, combining biology with technology. The domain-specific intended learning outcomes adequately cover the relevant knowledge, insight and experimental skills. There is sufficient attention to research skills, underlining the research-based nature of the programme. There is also attention to professional competences, such as communication and working in an international environment. The panel notes the programme is clear on how it compares itself with other international programmes in this field.

Regarding the master's programme Biotechnology, the panel notes the following. The intended learning outcomes are general and multidisciplinary. The international focus of the programme is adequately incorporated into the intended learning outcomes. The panel does believe that the specialisations could be more clearly highlighted in the intended learning outcomes, as these specialisations teach students partly different competences and content.

Regarding the master's programme Bioinformatics, the panel notes the following. The panel appreciates the specific focus on bioinformatics and systems biology, and in that sense integrating biology and computer science. The panel finds the intended learning outcomes sufficient but very general. In addition, the distinction between some of the intended learning outcomes is not obvious. The panel recommends that the programme revisits and sharpens its intended learning outcomes, using the more specific outcomes of the master's programme Biotechnology. The panel suggests that this might involve adding the concept of leadership to the already existing concept of ownership. Finally, the panel recommends that the programme, when sharpening the intended learning outcomes, ensures that the two focus areas are sufficiently visible.

Taking these considerations into account, the panel assesses that the bachelor's programme Biotechnologie, the master's programme Biotechnology and the master's programme Bioinformatics meet this standard.

Teaching-learning environment

Standard 2: The curriculum, the teaching-learning environment and the quality of the teaching staff enable the incoming students to achieve the intended learning outcomes.

Findings

The academic year consists of 6 periods. Period 1, 2, 5 and 6 comprise seven weeks of classes, time for self-study and the exam week. In these periods, students of all programmes often follow two courses worth 6 EC each. Periods 3 and 4 entail four weeks in which both the lectures and the exams take place. In these periods, students usually follow one course worth 6 EC.

The curricula and teaching-learning environment of the bachelor's programme and the two master's programmes are discussed separately. General information is then given for the three programmes on programme-specific facilities, admission criteria and staffing.

Bachelor's programme Biotechnologie

The Dutch-language fulltime bachelor's programme has a duration of three years and comprises a total of 180 EC.

The curriculum contains four compulsory study tracks: the chemical track, the mathematics & engineering track, the biological track and the integrative track. The study tracks lead to the five core courses: Microbial physiology, Protein biochemistry, Gene technology, Separation process design and Biotechnology 2. Skill learning lines, with disciplinary and general academic skills, are integrated in the four study tracks.

The compulsory study tracks are followed by the individual study track consisting of restricted optional and free electives courses and/or a minor and the compulsory, but individual bachelor's thesis. As the compulsory part of the Biotechnological Bachelor of Science programme is broad, students can use the optional part of the curriculum for specialisation or exploration of neighbouring fields. In the restricted optional in the second year, students choose a course that applies scripting or coding within either an engineering or a molecular biology context.

In 2018, the previous accreditation panel recommended making learning lines more explicit. The programme has started an improved learning line alternating mathematics and process engineering. It also redesigned the engineering courses to get a more logical order. In addition, one of the core courses of the biological learning line was aligned with the research lines at Wageningen University. First years students are introduced to the different learning lines during the first course. According to the programme, innovation of the learning line and courses led to a better link between the courses.

Another learning trajectory that the programme is improving at the moment are the academic skill learning lines. Academic skill development has been integrated in the disciplinary learning lines for a long time, but students were, and are, often not aware of it. Therefore, the programme developed a visualisation tool. Aligning academic skills with skills needed in later careers (as sourced by surveying alumni) allows students to reflect on their current ability and set a target for what they wish to achieve in the future.

The previous accreditation panel believed that all students should have basic knowledge of programming and/or coding by the end of the bachelor's programme. To ensure that all students encounter the basics of coding during their bachelor, the programme adapted one restricted optional cluster to include courses with programming and coding only.

Throughout the programme, a mixture of teaching methods is used. The average number of contact hours is 26 hours per week. The programme is one of the three programmes offering the most practical hours of all Wageningen University programmes. This reflects the application oriented character of the programme. The programme introduced a new practical during the integrative course Biotechnology 1. Consequently, students build and run a bioreactor by themselves at the end of the first year.

Master's programme Biotechnology

The English-language fulltime master's programme has a duration of two years and comprises a total of 120 EC. From the start of the programme, students are stimulated to define their own learning path. They have to choose a specialisation and courses fitting best to their personal goals. The programme offers five specialisations: 1. Cellular Molecular Biotechnology, 2. Food Biotechnology, 3. Medical Biotechnology, 4. Process Technology, 5. Environmental and Biobased Technology. All specializations have a common structure. The first year starts with 24 EC of specialization courses and 24 EC of free electives. Half of the specialization courses are compulsory and the other half are restricted optional courses. The first year is finalized with 12 EC in Bioprocess design. Students from all specialisations follow Bioprocess design in mixed teams.

The second year consists of the compulsory thesis (36 EC) and an academic level internship (at companies, research institutes or universities other than Wageningen University) or research practice (within Wageningen University) (24 EC). The choice of a specialisation determines at which chair groups students are allowed to perform their compulsory thesis. In addition, most chair groups ask students to follow defined restricted optional courses prior to the start of the thesis.

Restricted optional and free elective courses have to be chosen in consultation with a study advisor and must be relevant to the study goal of the individual student. Many students choose additional specialized courses to prepare for the thesis. Other students choose to broaden their scope. Occasionally, optional EC are used to perform an additional thesis or to increase the length of the thesis or internship. In the past academic years, most of the graduates completed the Cellular Molecular, Medical or Process Technology specialisation. Fewer graduates choose for food, environmental or biobased oriented specialisations.

The programme reacted on developments in the field. Besides adapting existing courses, four new courses were implemented recently: three courses are on protein transition and cellular agriculture and one on economic aspects for biotechnology. At the moment, the programme considers a new advanced course on protein biochemistry. The courses on cellular agriculture were set up as a learning line. To get capacity for new courses, 3 thesis preparation courses were terminated at the moment that the corresponding research lines stopped.

During the first year, the programme applies a mix of teaching methods. The compulsory courses of the cellular molecular and process

technology specialisations, Computational biology and Transfer processes, apply intensive teaching methods. In this way, more learning outcomes can be reached within the given number of EC. In general, courses offer fewer laboratory classes and more project and group work than courses in the bachelor's programme. Projects are often used to teach students research and design. Group work is crucial to learn how to function in multi- and interdisciplinary teams.

For students lacking lab experience in their bachelor's education, the programme offers the possibility to follow a laboratory course prior to the start of the master.

Master's programme Bioinformatics

The English-language fulltime master's programme has a duration of two years and comprises a total of 120 EC. To align the knowledge levels of students from varying backgrounds, the programme starts with basic courses that provide students with knowledge and skills in the domains that they missed in their pre-education. In addition, the two main tracks, bioinformatics and systems biology, offer restricted optional courses to enable students from varying knowledge backgrounds to specialize further in one of the two directions.

The first year is composed of 60 EC of courses. The programme has 4 compulsory elements followed by an individual part with thesis and internship.

The first element consists of compulsory 6 EC basic courses, depending on the student's previous education. For example, students without programming experience start the Master of Science programme with the course Programming in Python, while students with a background in informatics start with the course Personal genetics. Students who did not follow Computational biology in their bachelors have to add this course to their individual programme. If a student meets the learning outcomes of all basic courses prior to enrolment, students have to select other courses rather than getting an exemption for the EC.

The second element contains 18 EC of compulsory courses on bioinformatics and systems biology. As a third element, students have to choose at least 6 EC of an (additional) molecular biology course, 6 EC of a statistics or machine learning course and 6 EC of one of the tracks, bioinformatics or systems biology. The fourth element is an academic master cluster worth 12 EC. Those courses are completed with optional courses.

The second year consists of the compulsory thesis (36 EC) and an academic level internship (at companies, research institutes or universities other than Wageningen University) or research practice (within Wageningen University) (24 EC).

In the past academic years, a majority of the graduates took the bioinformatics track.

In the past years, the programme improved 5 elements. Firstly, the course Advanced bioinformatics became compulsory to ensure every graduate has a broad basis in both bioinformatics and systems biology, and to enable cohort forming. Secondly, the systems biology track got more focus by offering Advanced systems biology and Modelling in systems biology. Thirdly, the restricted optional cluster on statistics was extended with courses on machine learning and deep learning to offer more options linking statistics directly to computer science. Fourthly, the restricted optional cluster on life sciences was extended with the courses Applied nutrigenomics and Computational and Applied protein biochemistry to offer links to

more current research applications. Fifthly, the programme started to introduce a level 4 description for advanced courses, e.g. for Algorithms in bioinformatics and Advanced systems biology to build clearer trajectories for the two tracks (bioinformatics and systems biology).

In 2018, the previous accreditation panel recommended making ethics more visible. Now, the programme offers a specific course Data Science Ethics. Responsible data science was added to existing, technical courses.

The average number of contact hours in teaching weeks is 24. Classroom methods are used for content, interaction, participation and communication. Hands-on exercises are used as examples of the theory and for obtaining the required technical skills. Many courses use hands-on assignments to assess course learning outcomes, to develop critical thinking, and to develop the ability to synthesise information. The first compulsory course, Computational biology, is mainly practical based.

Programme specific services and facilities

Most of the teaching activities are organized in one of the relatively new educational buildings, that also include laboratory practical rooms based on the newest innovations. Besides these general facilities, the students can make use of the facilities from the different chair groups to perform all kinds of analyses.

For the biotechnology programmes, new specific equipment was introduced, such as a number of small bioreactors for advanced practicals. Bioinformaticians require advanced high-performance computing facilities. A number of chair groups at Wageningen University have invested in hardware specifically for bioinformatics research and education.

From the start until the end of the bachelor's and master's programmes, pro-active and upon request personal guidance is provided. Pro-active action is taken upon students with a delay in study progress according to a monitoring protocol developed by the programme team. The team for the bachelor's and master's programmes Biotechnology contains 6 study advisers and for the master's programme Bioinformatics there are 2 study advisors. They are dedicated to guide students through their studies. For students with a functional disability, students can also appeal to the study advisor, the student deans or psychologists.

Admission requirements

Students are admissible to the bachelor's programme with a vwo diploma with the profile Nature and Technology and/or Nature and Health.

Two years ago, the bachelor's programme was allowed to increase the entrance requirements for mathematics from high school mathematics A or B to mathematics B. Before that time, two-thirds of the students with limited mathematic background dropped out because they were not able to reach the aimed learning outcomes in mathematics and engineering. Since the programme increased the mathematics entrance requirements, fewer students face problems with mathematics and engineering courses according to the programme.

In the past, a strong increase of student numbers enforced the bachelor's programme to set a numerus fixus. Since the obligatory entrance level for mathematics was increased, the numerus fixus is no longer necessary. The programme states it even has to take care that the influx will not decrease more.

For the master's programme Biotechnology, the entry requirement is a bachelor's degree in Biotechnology,or equivalent. The students coming in from the bachelor's programme Biotechnologie are a substantial part of the total amount. Also, a large number of students is coming in with a non-Dutch bachelor's degree or with an HBO (University of Applied Sciences) bachelor's degree.

The influx in the master's programme Biotechnology is highly diverse in terms of nationalities, knowledge and skills, school systems, and learning styles. In the 2024-2025 academic year, 52 nationalities are enrolled.

For the master's programme Bioinformatics, the entry requirement is a bachelor's degree in Life Sciences, Bioinformatics or Computer science.. The influx is highly diverse in terms of nationalities, knowledge and skills, school systems, and learning styles. In the 2024-2025 academic year, 25 nationalities are enrolled. The students of the programme come from the fields of e.g. bioinformatics, biotechnology, biology, molecular life sciences, computer science, etcetera. Students from a university of Applied Sciences often have good programming skills, while students with a life science programme background have a better understanding of the traditional biology domains, cell structure and organization, genetics, ecology, and evolution. Students with a background in computer science often lack knowledge in life science, but are even better prepared for computational techniques than students from a University of Applied Science.

Staff

The current student staff ratio of the Biotechnologie Bachelor of Science programme is 13:1. The master's programme Biotechnology has a student staff ratio of 15:1. The master's programme Bioinformatics has as student staff ratio of 13:1. Staff are often active in both the bachelor's and master's programmes. 95 percent of the teachers followed the track of the basic didactic qualification (UTQ) at Wageningen University or its forerunner.

Full professors and tenure trackers teach a number of compulsory courses, nearly all other lecturers are PhD level. A few exemptions are some lecturers in the basic mathematic courses. In some cases, technicians participate in practical lab classes where they assist the main lecturer. All study advisors of the programme are teachers and part of the lecturer teams involved in core courses.

To reduce the work pressure, chairs have hired new staff, bridged gaps by hiring temporary staff, convinced retired staff to keep on teaching, and started to share staff for practical lab class assistance. In addition, a team from different chair groups is teaching in first years practical courses. This team enables chairs to appoint sufficient qualified teaching staff even at moments with a peak demand due to large student numbers in a single course. Moreover, according to the programmes, it accomplishes interaction and knowledge exchange between teaching teams of different courses and improves coherence in learning lines.

The university stimulates its staff to evaluate and further improve their English language skills, as stated in the university's Code of Conduct for Foreign Languages: 'All teaching staff at Wageningen University must be proficient in English. All lecturers are asked to evaluate and, if necessary, improve their level of English language proficiency. During recruitment and selection of new lecturers, explicit attention will be paid to their language proficiency'.

Students of the bachelor's and master's programmes are positive about their teachers. For example, students mention the support provided by teachers and study advisors as strength in the student chapter.

Considerations

The panel has determined that the contents of the bachelor's programme and the two master's programmes enable students to achieve the intended learning outcomes. The programmes have clearly translated the intended learning outcomes into the educational programmes. In the eyes of the panel, the admission requirements of the bachelor's programme and the master's programmes adequately match the programmes. The panel notes that tightening entry requirements in mathematics for the bachelor's programme has visibly strengthened the alignment with the required level in the programme.

In the eyes of the panel, the didactic concept and educational formats of the programmes are excellent and support the learning process of the students. The panel is positive about the (high) number of contact hours and the diversity in teaching methods. Students are constantly in contact with other nationalities and cultures, resulting in a good practice of the international classroom in the master's programmes. According to the panel, the teamwork, case studies and practicals in the courses offer sufficient opportunities for students to apply their knowledge and understanding. The intensive teaching methods in the programmes result in some very intensive periods but are essential to the programme and appreciated by students and the professional field. For master's programmes, the panel suggests paying attention to self-learning, as students report that they hardly need to do any homework and can do most of the study during contact hours.

The university has opted for a format of six periods per year, with a short third and fourth period, so that minors, for example, fit well with teaching elsewhere. However, the panel notes that for some courses, the third and fourth period is on the short side to fully grasp a lot of new material. Students also perceive other times in the year as quite busy. The panel recommends that the programmes carefully evaluate the teaching schedule. In particular the positioning of the mandatory course Bioprocess Design merits in that context special attention as it is compulsory for all Biotechnology master students, thus key to progress through the masters. Currently the course runs during the final 8 weeks of the year meaning that, also due to its study intensity, students might find themselves with little time to ensure timely thesis and internship placements.

The tutoring and provision of information to students are conducive to study progress and tie in with the needs of the (international) students and students with functional disabilities. The level and quality of support from student advisers, who are also lecturers and therefore know the content of the programmes well, is strong, according to the panel. Students also speak very positively about this.

The panel observes that the programmes have a strong teaching team. The various disciplines are well represented by the input of staff from a variety of chair groups, as is practical and scientific experience. The panel observes that the staff is also qualified for the execution of the programme in terms of educational expertise. The panel notes that staff members have adequate English language skills for teaching which is guaranteed by the university's policy. The panel appreciates the opportunity to get an appointment with an emphasis on teaching, which increases the number of lecturers with a focus

on developing and delivering teaching. Students feel heard, seen, understood, respected, and appreciated by all the staff (study advisers and teachers).

A concern is still the high workload. The panel notes that this is adequately addressed in the past years and the workload is more manageable as a result. The panel observes for example that the programmes implemented sufficient measures to reduce the work pressure like hiring extra teachers that support in many courses. Also, the centralized exam supervisors have helped to reduce the time that staff members need to spend on exam invigilation.

The panel notes that the programmes have appropriate facilities and matching infrastructure, with well-equipped biotechnology labs.

The panel is positive about the internship in the master's programmes at one of the stakeholders in the work field. However, the panel understood that for both master's programmes, many students are unable to complete an internship within the allotted four-month period, leading to a longer study duration. The panel believes that the programme, in consultation with industry, should ensure that students are able to complete the programme in two years.

The panel has some specific considerations regarding the bachelor's programme Biotechnologie. The panel notes that the programme pays sufficient attention to updating the programme. For example, there is new content on data science and Artificial Intelligence (AI) tools. The panel appreciates the focus on de-implementing courses from the programme to make room for more innovations. It is clear to the panel that the curriculum is designed to enable students to follow study tracks in a logical order and support cross-links between tracks. The recent changes in the design of the programme, with the strengthening of learning lines, leads to a more coherent programme with a good structure, the panel notes. According to the panel, the programme has sufficient focus to further strengthen the visibility of the learning lines, among other things.

In the Dutch-language programme, a number of courses and subjects are offered in English. The panel recommends that, when redefining which components are offered in English, the programme should consider that students find it less clear and feasible if both languages are used within a course. Students unequivocally noted that the use of English in some courses is appropriate, logical and useful for their education, to better prepare them for the English-taught master's programmes and the international work field.

The panel appreciates the start of the so-called BBT plus group, where delayed students receive extra support.

The panel has some specific considerations regarding the master's programme Biotechnology. The panel notes that the programme provides the right depth of knowledge and skills for the different specialisations, which is also positively appreciated by students. The rule that at least one in-depth course must be chosen in the area of the chosen thesis provides the required depth, according to the panel. The flexibility in choice options is also a strong point. In the programme, students get sufficient opportunity to practice skills on real problems. However, according to some students, the number of practicals during the courses could be increased even further. The mixed student population allows for an international and multidisciplinary learning environment.

The panel has some specific considerations regarding the master's programme Bioinformatics. The panel understands that bioinformatics and systems biology are interdisciplinary sciences, meaning they combine exact sciences such as mathematics and computer science with biology, a more empirical science. This requires not only that students understand the essence of high-throughput laboratory tools, but also that they can integrate theories and models rooted in the exact disciplines. The panel notes that the programme manages to integrate both well and offer both at a high level in the course. According to the panel, the programme manages to keep up with the rapid research developments in the field. The low student-staff ratio allows for intensive supervision.

The panel notes that the different backgrounds of the students make for an interesting and open learning atmosphere. Students have different levels in programming, for example, with the programme making great efforts to get everyone at the same level.

Students have a wide range of choices, and the supporting core subjects allow for a logical sequence of subjects in an individual programme. The flexible programme design with limited choice clusters allows for an individualised study pathway. While the panel has no doubt that students achieve the intended learning outcomes, the panel recommends ensuring that all students go into depth in a chosen domain. The current design of the programme in principle allows students to select an individual program that includes mostly basic subjects and thus might lack the required depth. Students should choose at least one advanced subject while maintaining sufficient freedom, according to the panel. In addition, it might be useful to consider offering a few "standard" programs/tracks that can either be selected as such, or serve as a basis for students to assemble a strong individual program.

A 12 EC subject in the first year is the Academic Master's Cluster. The panel concludes that students find this cluster of limited value, partly because most content is not linked to bioinformatics and systems biology. The panel advises the programme to keep the valuable academic master cluster, but make it more useful by designing projects that are more tailored to the programme.

In summary, according to the panel, the curriculum, faculty, and facilities for all four programmes form a cohesive, inspiring learning environment. Taking these considerations into account, the panel assesses that the bachelor's programme Biotechnologie, the master's programme Biotechnology and the master's programme Bioinformatics meet this standard.

Student assessment

Standard 3: The programme has an adequate system of student assessment in place.

Findings

In the bachelor's programme, the courses of the programme have a variety of assessment methods such as written exams (often computer-based) with closed and/ or open questions and exercises (or combinations), individual or group assignments, (computer)practical reports, case studies, presentations, and participation in course work (laboratory or tutorial/assignment performance). Most courses apply multiple summative assessments within a course to address the different types and levels of learning outcomes. Besides formal (graded) assessment, many courses also use forms of formative assessment of (on-line) peer-feedback and individual reflections to help the learning process of students.

In the master's programme Biotechnology, assessment methods vary between courses. Most courses apply multiple summative assessments within a course to address the different types and levels of learning outcomes. Specialisation courses assess advanced knowledge in written exams with closed and open questions. Learning outcomes on higher cognitive level, like application of advanced knowledge, judgements and design are mainly assessed in exams with open questions or by written reports or oral presentations. Besides formal (graded) assessment, many courses also use forms of formative assessment of (online) peer-feedback and individual reflections to help the learning process of students.

In the master's programme Bioinformatics, many courses include different types of assessments to monitor students' progress. The (combination of) assessment method(s) match the type of learning outcomes of a course and differs per course. Courses assess learning outcomes on the level of knowledge and understanding in written exams. Learning outcomes at higher cognitive levels are sometimes assessed in written exams with open question, but often by written reports, assignments, oral presentations, or oral exams.

In the course guides, the programmes provide detailed information about the assessment.

To properly assure the quality of interim examinations and final examinations, there are institution-wide guidelines and instructions for assessment. These guidelines and instructions include the following: the method of testing whether the student has met the learning outcomes; the procedures for testing in individual teaching methods; the role of assessment strategies and assessment criteria in the examination per course; and the supervision on these aspects by the Examiners and the Examining Boards.

Programmes and courses also have to embrace the developments in Artificial Intelligence (AI). The programmes stimulate students and teachers to discuss the responsible use of AI in education. The programmes discuss whether more oral examinations could be an appropriate reaction to the increased influence of AI on report writing. This topic is under attention within the entire WUR and various stakeholders in

education are working on guidelines and best practices. Information for all Wageningen University students is published on internet and support for teachers on intranet.

Wageningen University has four Examining Boards: Life Sciences, Social Sciences, Environment and Landscape, and Technology and Nutrition. Each of the Boards is responsible for the examination arrangements for one of the four groups of study programmes. Joint degrees have their own specific Examining Boards. The three programmes assessed here fall under the Examining Board Technology & Nutrition. This Board consists of a chair, a secretary, a second secretary, six members employed by the University and one external member (employed by Utrecht University).

The Examining Board evaluates the sets of study components, approves exemptions, and determines the results of the final evaluations of the study programmes. The Examining Board is also responsible for assuring the quality of interim examinations and final evaluations. The Examining Board periodically consults with the programme directors.

In 2018, the previous accreditation panel advised/recommended/suggested with regard to the thesis to uniform the weight of assessment criteria and add standard written feedback. As this comment was given to a number of Wageningen University master programmes, a university wide, online supported, assessment procedure has been rolled out since. Within this new procedure, both, similar weight as well as written feedback is embedded among other improvements.

At the moment, Wageningen University equalises the bachelor assessment form and evaluation rubric of the different life science bachelors at Wageningen University. The purpose is the alignment of bachelor thesis work among chair groups. In the meantime, the bachelor's programme added a final grade in addition to the total grade to stress that final marks are given in steps of 0.5 only. In addition, the programme blocked the possibility to ignore criteria (e.g. presentation or oral assessment) when calculating the final grade.

Considerations

The panel judges that the programmes have an adequate, solid assessment system and assessment procedures. The system is adequately based on the university wide policy, the panel notes. Multiple adequate assessment types are implemented in the programmes: from written exams to (individual and group) assessments. The panel believes that the variety of assessment formats allows students to develop the necessary knowledge and skills. Partly through the use of test exams prior to exams, it is clear to students how and on what they will be assessed.

In the student chapter of the master's programme Biotechnology, some critical comments are made about the chosen forms of assessment, for example about the amount of multiple choice exams. Although the panel notes that the test forms fit the learning objectives to be achieved, the panel recommends that the programmes evaluate whether the use of open questions, for example, is still feasible in some cases and could be a better option. This also requires attention to adequate skills assessment. The panel appreciates the programme's attention to this.

Another comment in the student chapter is that new students struggle with the expectations of the lecturers on how to answer exam questions. Some training on how to provide satisfactory

answers at exams might be helpful, according to the students. From the various interviews, the panel notes that the programme does work with sample assessments for most courses, to prepare students. However, there are differences between chair groups in the approach. The panel appreciates the focus on the transparency of the assessment and recommends that the programme monitors whether this is sufficient for all courses.

The panel appreciates the frequent use of group work, which is an appropriate assessment of the intended learning outcomes. The amount of feedback has increased in the past years. However, it did occur to the panel that attention is needed for individual assessment of group work.

According to the panel, the procedures for assessing the final product of the programmes, the thesis, are clear and the assessment itself is sound. However, the panel notes that the feedback on assessment forms of theses is not always of the same level. Also, the past years, different thesis forms are used and in a number of cases, for example, the feedback is limited or only mentions points for improvement, so that the grounds for the judgment are not in line with the outcome from the completed Rubric. The programme mentioned that there is a strong culture of providing verbal feedback to students immediately after the completion of their thesis. The panel emphasizes the need to not only share this feedback verbally with student, but to also include it as written feedback on the assessment form. The panel is pleased to hear that the examining board has paid attention to this in the past year, and that the assessment forms are being harmonised as a result. Also, there is attention to giving proper feedback on the forms, for example in calibration sessions with each other to assess whether the justification for a judgement can also be followed by outsiders. Lastly, it would be advisable to closely monitor the grading across different chair groups in order to keep ensuring a fair and consistent grading across all theses.

In interviews with management, lecturers, the Examining Board and students, the panel discussed how programmes deal with the use of AI by students. It became clear to the panel that there is a lot of focus on this issue within the university. Guidelines are in use and the university is tightening them further, the panel noted, but programmes would benefit from a stronger central policy, according to the panel. Students must indicate in their thesis whether and how they have used AI, but it is not yet clear what the implications are for assessment. Is the assessment lower if AI has been used for reporting, for example? The panel suspects that there are now differences between assessors and that both students and examiners would benefit from clearer guidelines and implications.

According to the panel, quality assurance of assessment is ensured by a pro-active Examining Board for the programmes. The Board, focusing on a group of programmes, show sufficient knowledge of the individual programmes and their assessment. In the years 2021 to 2023 the board was understaffed. Consequently, chair group visits/assessments were sometimes postponed. Since then, the capacity of the Board is sufficiently increased. For ensuring the quality and uniformity of assessment in general, the panel appreciates the increased use of calibration sessions in which assessors participate. The panel notes that the board is catching up and now adequately addresses the checks on the quality of assessment and final works.

Taking these considerations into account, the panel assesses that the bachelor's programme

Biotechnologie, the master's programme Biotechnology and the master's programme Bioinformatics meet this standard.

Achieved learning outcomes

Standard 4: The programme demonstrates that the intended learning outcomes are achieved.

Findings

Bachelor's programme

The bachelor thesis (24 EC) is the concluding part of the bachelor's programme. The thesis comprises research or design projects involving experimental work. The bachelor's thesis is directly linked to the research programmes of the biotechnological chair groups. Students join an on-going research project. With close supervision, students plan and design their own part of the project, execute experimental research, or design and present their results. The final assessment includes an evaluation of research competences, a written report, an oral presentation, and a final evaluation.

Graduates of the programme have unconditional access to different master's programmes at Wageningen University. With an appropriate minor in the third year, access is generally possible for related programmes. Nearly all graduates continue with an advanced master's degree, the large majority does so in the master's programme Biotechnology.

Master's programmes

The master thesis (36 EC) is the concluding part of the master's programmes. During the thesis, students join an on-going research or design project at the chair group offering the thesis. Most chair groups ask students to follow a certain restricted optional course prior start of the thesis. Students have to set up and perform their own part of research or design, and present results both orally and in a written report. Thus, the thesis is directly linked to both academic research and design.

In addition to the biotechnological chair groups at Wageningen University, the master's programme in biotechnology has been collaborating for about 20 years with the Molecular Medicine Master of Science programme at Erasmus Medical Centre to enable students also research in human related medical biotechnology.

The thesis of the master's programme in bioinformatics is always linked to the field of life sciences and contains programming, algorithm development, data mining, data analysis and/or modelling.

During the thesis, the student is supervised generally by a staff member, often with an additional PhD student as a daily supervisor. The final examination is conducted by the staff member and examiner.

After their thesis, students conclude their programme with a 24 EC internship, in which they need to apply all their learnings to individual research again, but now in the professional field outside the university. The students have learned the required domain knowledge and research skills in the courses and applied them in the thesis. In the internship the students should be ready to apply their research methodology on new topics in new environments and quickly acquire the required knowledge on the specific research field. The generally good results in the internship proof this is indeed the case.

Most graduates have a job or job offer on academic level at the moment of their graduation. More than half of the graduates start a PhD project after their master's. Those PhD position are spread over different universities in the Netherland and worldwide.

Considerations

To form an opinion about the final level of the students, the panel read recent theses of a total of fifteen graduates per programme and viewed the assessments of these works. The selection included theses with a variety of topics and a distribution between lower and higher grades. The panel found that all the theses attested to the bachelor's or master's level and the content matches the profiles of the programmes. The quality of the works varies, with the grade given corresponding to the panel's assessment of quality. In general, the panel was pleased with the quality of the work. Adequate research ability is evident in all theses. This finding is in line with the strong research profiling of the bachelor's programme and the master's programmes.

From surveys and conversations with alumni, the panel concludes that the bachelor's alumni have access to subsequent master's programmes for which students have acquired appropriate knowledge and skills. According to the panel, master's programmes prepares students very well for the job market and that students end up in positions that fit the intended exit profiles. Most of the graduates of the master's programmes will work in the food industry, academic research, or applied research (research institutes).

From the interviews, the panel established that alumni policies were currently limited to the central university level. Existing alumni relations at programme level were mostly informal, which means that the possibilities that alumni have to offer were not optimally used. The panel recommends that programmes strengthen formal contacts with alumni.

Taking these considerations into account, the panel assesses that the bachelor's programme Biotechnologie, the master's programme Biotechnology and the master's programme Bioinformatics meet this standard.

Attachment 1: assessment panel

Stanley Brul, chair, is a professor at the University of Amsterdam specializing in microbial food safety and molecular biology. He has led research projects funded by NVWA and NWA-ORC METAHEALTH. He is also an educator, program coordinator, and evaluator for academic programs, contributing to various national and international scientific committees.

Marloes van Dort is a senior education policy advisor at Erasmus University Rotterdam. She has expertise in curriculum development, assessment, and educational policy. She played a key role in implementing new study programs and quality assurance frameworks.

Kevin Verstrepen is a professor at KU Leuven and director of the VIB-KU Leuven Center for Microbiology. He has published over 150 papers on genetics and biotechnology and has received multiple teaching awards. He has international teaching experience, including at Harvard University and Tianjin Institute.

Olga Kalinina is a professor of Drug Bioinformatics at Saarland University. She has expertise in protein evolution, genotype-phenotype relationships, and antimicrobial resistance. She has worked at EMBL, Max Planck Institute, and Helmholtz Institute, leading major research projects worth €6.9 million.

Koen Wijsman is a recent MSc Medicine graduate from Leiden University. He is currently a Research Trainee at the Mayo Clinic, Department of Gastroenterology, and has completed NVAO training as a student panel member.

The panel was supported by Linda van der Grijspaarde as an independent secretay on behalf of AeQui.

All panel members have completed and signed a statement of independence and impartiality, and these have been submitted to NVAO.

Attachment 2: site visit program

Thursday 16 January 2025

Time	What	Who
12.00-13.00	Arrival panel; lunch and preparation	
13.00-13.45	Management of programmes	Member Board of Education Programme Director Dean of Education Chair Programme Committee
13.45-14.00	Break	
14.00-14.45	Students BBT	BBT-2 (2023) BBT-3 (2022) BBT-1 (2024) BBT-2 (2023) BBT-3 (2022) BBT-2 (2023) BBT-3 (2019)
14.45-15.00	Break	
15.00-15.45	Students MBT + alumni	MBT-2 / Spec.D-Proc.Techn. MBT-1 / Spec.D / Proc.Techn. MBT-1 / Spec.A Cel. And Mol. Biotechn. MBT-1 / Spec.C Medical Biotechnology MBT-2 / Spec.D-Proc.Techn. Alumnus 2024, currently doing a PhD Alumnus 2024, currently doing a PhD Alumnus 2022, Unilever
15.45-16.00	Break	
16.00-16.45	Teaching staff BBT and MBT	Microbiology (lecturer) Cell Biology and Immunology (lecturer) Bioprocess Engineering Group (lecturer) Organic Chemistry (lecturer) Bioprocess Engineering Group (chair holder and lecturer) Biochemistry (lecturer and study advisor)
16.45-17.30	Deliberations, wrap-up day 1	
18.30	Diner panel at hotel	

Friday 17 January 2025

Time	What	Who
9.00-9.30	Arrival of the panel	
9.30-10.15	Students MBF + alumni	MBF-1 MBF-1 MBF-2 Alumnus 2022, currently doing a PhD MBF-2 MBF-2 MBF-2 MBF-2
10.15-10.30	Break	
10.30-11.15	Teaching staff MBF	Bioinformatics (lecturer) Systems and Synthetic Biology (lecturer) Systems and Synthetic Biology (lecturer) B ICT, Bioinformatics (lecturer) Bioinformatics (lecturer) Bioinformatics (lecturer)
11.15-11.30	Break	
11.30-12.15	Examining Board Technology and Nutrition + Study advisor(s)	deputy chair EBTN secretary EBTN – Quality Assurance secretary EBTN – student related matters study advisor study advisor
12.15- 14.30	Lunch and deliberation	
14.30-14.45	Optional: Management of the programmes	<not used>
14.45-15.15	Preliminary feedback	
15.15-16.30	Development dialogue	
16.30	Closure of the day - drinks	

The open consultation took place online prior to the visitation. No students or staff members attended this.

Attachment 3: Recommendations from previous assessment

The programmes were last visited for accreditation in 2018. The following overview of recommendations from the previous visitation and follow-up by the programmes is taken verbatim from the critical reflections. The panel states that the programmes have incorporated the recommendations well. Under the various standards, the panel addresses this.

Bachelor's programme Biotechnologie

Recommendation: For the teaching and learning environment, the panel advised to make learning lines more explicit.
Reaction: To make learning lines more explicit, the mathematics and engineering study track was redesigned. In addition, one of the core courses of the biological learning line was aligned with the research lines at Wageningen University. This causes a better link between this learning line and current thesis topics. Furthermore, we aimed to make programme specific and academic skill learning lines clearer to students by graphic information. First years students are introduced to the different learning lines during the first course with this new material.

Recommendation: All students should have basic knowledge on programming and / or coding at the end of the bachelor.
Reaction: To ensure that all students encounter the basics of coding during their bachelor, one restricted optional cluster was adapted to include courses with programming / coding only.

Recommendation: For the standard student assessment suggestions were given to ensure equal procedures and feedback at all chairs and to increase the number of chair group visits by the Examining Board.
Reaction: Most advice to improve assessment procedures were made for many Wageningen University (WU) programmes. The master thesis procedure was adapted for all Wageningen University programmes. On the bachelor level, we are at the moment in the process to align the assessment strategy with similar Wageningen University bachelors. We want to learn from the improvement of the master thesis assessment trajectory and transfer the best practice to the bachelor thesis assessment

Master's programme Biotechnology

Recommendation: the panel emphasized the importance of sustainability with respect to measures dealing with increasing student numbers.
Reaction: Indeed, student numbers are much easier to handle today. Measures to regulate the bachelor influx flattened the increase in master students some years later

Recommendation: The panel recommended with regard to the thesis to uniform the weight of assessment criteria and add standard written feedback.
Reaction: As this comment was given to a number of Wageningen University master programmes, a university wide, online supported, assessment procedure has been rolled out since. Within this new procedure, both, similar weight as well as written feedback is embedded among other improvements.

Master's programme Bioinformatics

Recommendation: The panel recommended with regard to the thesis to uniform the weight of assessment criteria and add standard written feedback.
Reaction: a university wide, online supported, assessment procedure has been rolled out since. Within this new procedure, both, similar weight as well as written feedback is embedded among other improvements.

Recommendation: The panel recommended the programme to pay attention to the bioinformatics identity of the students, by enabling and supporting all students from the same cohort to regularly meet.
Reaction: An additional course, specific for Master of Science Bioinformatic programme, is compulsory today. A number of new data science courses are offered and bioinformatics and systems biology learning lines are pointed out by the study advisors and outlined in the course catalogue. Those measures ensure that students of one cohort meet more often. In addition, all graduates get a solid base in both, bioinformatics, and systems biology. As a consequence, the Programme Committee suggests to change the name of the programme into Bioinformatics and Systems Biology.

Recommendation: make ethics more visible.
Reaction: Today, we offer a specific course Data Science Ethics. Responsible data science was added to existing, technical courses. Students in the Programme Committee agreed that ethic was not visible in the former programme and supported the addition of ethics to the programme, but strongly preferred integration in current courses and the Data Science Ethics course as a restricted optional.

Attachment 4: reviewed documents

Self-Evaluation

- Self-Evaluation Report of the three programmes

Appendices bachelor's programme:

- Intended programme learning outcomes and Dublin descriptors of Biotechnology Bachelor of Science programme
- Schematic overview Biotechnology Bachelor of Science programme
- Course descriptions: content, learning outcomes, teaching, and learning activities, examinations and literature
- Education and Examination Regulations
- Relation programme learning outcomes and courses
- Staff overview, including their qualifications
- Bachelor Thesis biotechnology assessment form
- BPW, BBI, BBT, BML thesis assessment rubric

Appendices master's programme Biotechnology:

- Intended programme learning outcomes and Dublin descriptors of Biotechnology Master of Science programme
- Schematic overview Biotechnology Master of Science programme 2024/2025
- Course descriptions: content, learning outcomes, teaching, and learning activities, examinations and literature
- Education and Examination Regulations
- Relation programme learning outcomes and courses
- Staff overview, including their qualifications

Appendices master's programme Bioinformatics:

- Intended programme learning outcomes and Dublin descriptors of the Master of Science programme Bioinformatics
- Schematic overview of the Master of Science programme Bioinformatics 2024/2025
- Course descriptions: content, learning outcomes, teaching, and learning activities, examinations and literature
- Education and Examination Regulations
- Relation programme learning outcomes and courses
- Staff overview, including their qualifications

General documents

- Assessment Policy WUR 2023
- Framework for education Wageningen University
- Study Advice Service level commitment (Oct. 2023)
- Development dialogue BBT MBT MBF

Courses

- Selection of courses each programme

Thesis

- 15 theses and assessments per programme
- Thesis Course Guide Wageningen University 2023-2024

Internship

- Sample of 12 internship reports
- Overview internship reports MBT MBF

Examining board

- Annual letter Examining Boards 2024
- FBE Annual Report 2020-2021
- FBE Annual Report 2021-2022
- FBE Annual report 2022-2023

Programme committees

- Programme Committee Annual reports and year plans of the past four years

AI additional information

- AI rules and guidelines for education
- Message from Examining Boards AI (Sept. 2023)
- Slides to prep students on GenAI (July 2024)