

EDUCATIONAL ASSESSMENT - LIMITED PROCEDURE
MASTER OF SCIENCE IN BIOINFORMATICS - KU LEUVEN

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# PART 1 General Section

# EDUCATIONAL ASSESSMENT LIMITED PROCEDURE

Master in Bioinformatics

#### 1 Introduction

In May 2014 an assessment panel reviewed the master programme Bioinformatics of KU Leuven. The panel's conclusions were published in May 2016 in the report "Toegepaste Biologische Wetenschappen (boek 2) - Een evaluatie van de kwaliteit van de academische opleidingen Toegepaste Biologische Wetenschappen".

Based on this report the study programme applied for accreditation from the Dutch-Flemish Accreditation Organisation (NVAO). In accordance with the Decree on the Structure of the Higher Education in Flanders, KU Leuven submitted a request, accompanied with an improvement plan. The master programme received accreditation with limited validity, until the end of the academic year 2018-2019 (i.e. October 1, 2019).

#### 2 Limited procedure

Before the expiration of the accreditation date, the study programmes must reapply for accreditation. This limited accreditation procedure entails a self-evaluation report by the study programme, a site visit carried out by an independent panel of expert peers, and the publication of the panel's findings in an assessment report. With the resulting assessment report, the study programmes can apply for accreditation by NVAO.

The reassessment is limited to the generic quality standards (GQS) that were evaluated as unsatisfactory in the first assessment:

- GQS 2: Educational learning environment<sup>1</sup>
- GQS 3: Outcome level achieved2

<sup>1</sup> GQS 2 was evaluated as satisfactory for the Science major and unsatisfactory for the majors Bioscience Engineering and

<sup>2</sup> GQS 3 was evaluated as satisfactory for the Science major and unsatisfactory for the majors Bioscience Engineering and

#### 3 Composition of the panel

The assessment panel of Bioinformatics consisted of 4 members. The composition of the assessment panel was ratified on July 2, 2018, October 5, 2018 and November 26, 2018 by the VLUHR Quality Assurance Board. The NVAO sanctioned the panel composition on March 4, 2019. The VLUHR Quality Assurance Board subsequently installed the assessment panel by its decision of March 6, 2019.

The assessment panel was composed as follows:

- Chairman
  - Jaap Heringa, professor Bioinformatics and director Centre for Integrative Bioinformatics, Vrije Universiteit Amsterdam (VU)
- Panel members:
  - Dick De Ridder, professor Bioinformatics, Wageningen University
  - Anders Krogh, professor Bioinformatics, Department of Biology and Department of Computer Science, University of Copenhagen
  - Reza Afkhami, Master in Biology (Cell and Molecular Life Sciences), University of Brussels

Stefanie Van der Jeugt, policy advisor Quality Assurance at the VLUHR Quality Assurance Unit, was the project manager and secretary of the panel.

The curricula vitae of the panel members are attached (see Appendix 1).

#### 4 Task of the assessment panel

For this reassessment, the programme prepared a self-evaluation report. The VLUHR Quality Assurance Unit received this report in December 2018 and distributed it to the panel members. Hence, the assessment panel had the opportunity to study the information stated in the selfevaluation report and to prepare the visit accurately.

The panel visited the programme on March 26 and 27, 2019. During the visit, the panel had meetings with the programme management, students, alumni and teaching staff. The panel also had the opportunity to consult a representative set of study materials, 30 master's dissertations and a representative set of evaluation assignments and examination questions. The discussions were held in a very constructive way. The visit schedule is attached (see Appendix 2).

Finally, the panel presented its findings and conclusions regarding the assessed standards in a draft report. This was done in accordance with the "VLUHR Manual for the external quality assurance in Flemish higher education, 2015". The draft was sent to the programme management under embargo for a response. The panel incorporated the reaction of the programme in its final report insofar it agreed with the remarks.



# PART 2

Assessment report

## **KU LEUVEN** Master in Bioinformatics

#### 1 Introduction

The Master of Science in Bioinformatics/Bio-informatica at KU Leuven is a two-year master programme of 120 credits. This master programme has an English variant (with courses taught in English) and a Dutch variant (with courses taught in Dutch and English). Both variants consist of three majors:

- Science/Wetenschappen,
- Bioscience Engineering/Bio-ingenieurswetenschappen,
- Engineering/Ingenieurswetenschappen.

In the following report the English terms are used to refer to both language variants, unless otherwise indicated. The major Bioscience Engineering leads to the title 'bio-ingenieur' (bio-ir.). The major Engineering leads to the title 'ingenieur' (ir.).

The programme is jointly organised by four faculties: the Faculty of Bioscience Engineering, the Faculty of Engineering Science, the Faculty of Medicine and the Faculty of Science. The Faculty of Bioscience Engineering is administratively responsible for the programme. This implies that the dean of the faculty makes decisions regarding the assignment of lecturers, that master's theses are managed under the administrative process of the faculty and that PR activities are managed in collaboration with this faculty. The other faculties are mainly involved through the lecturers who are active in the programme and in the Permanent Educational Committee (POC). The POC consists of three lecturers from each of the four faculties involved, four students, two research assistants, a representative from the professional field and an administrative assistant of the programme. The committee discusses topics like the vision, the aims, the content, the learning goals and the evaluation processes of the programme.

Based on a need for experts in the field of bioinformatics, KU Leuven started a one-year postgraduate master programme in Bioinformatics in 2001-2002. In 2007-2008 the programme became a two-year initial master. The aim of the programme is to train qualified bioinformaticians who are able to integrate knowledge about biology, information technology, mathematics and statistical techniques. Therefore, graduates have the ability to design, manage, analyse and interpret data from high-throughput molecular biological experiments that are characterised by a high complexity and dimensionality and to independently develop new methods for solving future bioinformatics challenges.

A comprehensive programme reform took place in 2013-2014. Consequently, during the previous assessment the programme was in a transition phase. The assessment panel of 2014 evaluated GQS 1 (targeted outcome level) as satisfactory for all the majors and language variants. GQS 2 (educational learning environment) and GQS 3 (outcome level achieved) were evaluated as satisfactory for the Science major and as unsatisfactory for the Bioscience Engineering major and the Engineering major. Several recommendations were made by the panel. The programme submitted an improvement plan to NVAO in 2016. After evaluation of the improvement plan, NVAO decided to grant the programme accreditation with limited validity until the end of the academic year 2018-2019.

The total number of students varies between 40 and 60 students. In the academic year 2018-2019 55 students are enrolled in the programme, 29 of these are new students. The Science major attracts most students (44 students) in comparison with the Bioscience Engineering major (9 students) and the Engineering major (2 students). All students are registered in the English variant of the programme.

#### 2 Reassessment

#### **GENERIC OUALITY STANDARD 2: EDUCATIONAL LEARNING ENVIRONMENT**

The assessment panel evaluates the educational learning environment of the Dutch and English variant of the Bioscience Engineering major of the Master of Science in Bioinformatics as satisfactory.

The assessment panel evaluates the educational learning environment of the Dutch and English variant of the Engineering major of the Master of Science in Bioinformatics as satisfactory.

#### Assessment 2016

The panel was convinced that the content and design of the programme offered insufficient guarantees to achieve the learning outcomes for the major Bioscience Engineering and the major Engineering. To be more specific, the panel stated that the learning content, the learning activities and the objectives and content of the master's theses were not related to specific engineering competences. Furthermore, the panel voiced some concerns about the visibility/importance of topics such as ethics, privacy and social implications of bioinformatics in the curriculum, about overlapping courses due to planning difficulties, about the increasing need of teaching assistant support for the hands-on courses, the availability of teaching staff and the interpretation of team teaching and about the need for capable computing servers. Knowing that the programme was recently reformed, the panel stressed the importance of constant programme monitoring, e.g. based on student evaluation. Consequently, the panel evaluated GQS 2 'Educational learning environment' as unsatisfactory for both majors.

#### Reassessment 2019

In general, the reassessment panel (2019) is satisfied with all the positive changes that followed after the first assessment. Within the constraints of the interfaculty approach, the KU Leuven policy and governmental law, the programme has improved significantly. For example, the distinction between the majors is now clear and the quality of the master's theses fulfils the panel's expectations. The panel observes that the programme has made a clearer distinction between the different majors (e.g. in the learning outcomes, the curriculum and the theses). In the panel's opinion the need for three different majors must be understood in the local context. According to the programme management, Bioscience Engineering and Engineering students

who opt for the Master in Bioinformatics, after their Bachelor in Bioscience Engineering or Engineering, are set on achieving the 'bio-ir.' or 'ir.' title because it opens up a lot of opportunities in the job market. The combination of their Bachelor's degree and the Master's degree should make them worthy to carry this title. Nevertheless, from an outside perspective it is remarkable that a Master's title largely depends on the Bachelor programme followed.

After the previous assessment, the programme invested in restructuring the curriculum to tackle the remarks of the previous panel. The programme now contains five main parts:

- (1) a different reorientation package for each major,
- (2) a specific package for Bioscience Engineering students,
- (3) a specific package for Engineering students,
- (4) a common package for all students and
- (5) the master's thesis.

The Science students follow reorientation courses in biology, IT, Mathematics and Statistics (26 credits). The Bioscience Engineering students follow reorientation courses in IT (14 credits), they take a specific course on biofluidics (3 credits) and choose between a few elective courses (9 credits). The Engineering students follow reorientation courses in biology (14 credits), they take a specific course on designing software systems (6 credits) and choose between a few elective courses (6 credits). With some exceptions, the elective courses for the Engineering and Bioscience Engineering major are the same. The common package (64 credits) is divided into three modules: bioinformatics, biology and statistics. The courses within each module are spread over the four semesters in a logical order. These three modules are translated in three learning trajectories with a similar name. The master's thesis is the final part of the programme (30 credits). The theses in the Science major focus on solving a biological or biomedical research question using bioinformatics methodology. The theses in the Engineering and Bioscience Engineering major focus on the development of novel bioinformatics methodology. The panel is convinced that the structure of the revised programme has improved, in the sense that differentiation between the majors is now present and visible. Students and alumni appreciate the programme and they believe the programme is well-organised and coherent. The panel noticed that the courses of the programme have a widely varying number of credits due to their embedding in different faculties and their policies. Also, because elective courses are scheduled by the faculty that organizes them, schedule overlap is possible. These facts make it hard for students to combine elective courses. Therefore, the panel strongly recommends to work out a more uniform credit system (e.g. 3/6/9 or 5/10 credits per course) and schedules with fixed blocks. The panel is aware that this will require creativity/ flexibility of the faculties involved.

The panel believes that the content of the programme enables students to achieve the learning outcomes. The programme contains all the major elements that can be expected in a Bioinformatics MSc programme. In the panel's opinion, the reorientation package helps students reach similar basic levels in biology, mathematics and computer science and this ensures that the students are appropriately equipped for continuing with the common package of courses. The content of the common package is well chosen. Given the structure and the context in which the programme is embedded, the panel advises to deepen the engineering majors somewhat more by introducing more challenging "engineering versions" of one or two core courses. The panel sees that the learning outcome on ethics forms an explicit part of the programme now. The panel remarks that the naming of some courses could be better, because the course names do not always cover their specific content and this can cause confusion for (potential) students. Therefore, the panel recommends to make a clear distribution of content over the courses, to think about the most fitting name for each course and to communicate more clearly about connections between courses. Students can find all necessary information about each course on Toledo, the virtual learning environment of KU Leuven.

In the academic year 2018-2019 55 students are enrolled, 29 of which are new students. The Science major attracts most students (44 students) in comparison with the Bioscience Engineering major (9 students) and the Engineering major (2 students). All students are registered in the English variant of the programme. The panel suggests it would be good to advertise the Master programme in Bioinformatics more in the Bachelor programmes preceding each major, perhaps as a part of its courses or as a project. The programme management indicated that the small influx of Bachelors in Bioscience Engineering can partially be explained by the fact that the Master programme in Bioscience Engineering offers a minor in Bioinformatics in addition to the full-fledged master's programme considered in this report.

The programmme's academic staff consists of 39 professors, of which 18 full professors, 6 professors, 7 associate professors, 7 assistant professors and 1 guest professor. Every professor teaches only part of the programme (between 0,34 and 9,5 credits). The panel believes that the teaching staff, consisting of highly qualified researchers, is excellent. The programme has attracted two faculty members specifically for the Bioinformatics programme. Besides, courses are built on the wide expertise available in the participating faculties. Students and alumni are very positive about the mix of experts in various courses. Also, the panel is under the impression that the academic staff works together closely to maintain a strong programme, as evidenced by their involvement in improving the programme and the teacher days organized over the past years. Although the workload of teaching staff is demanding, the panel finds that there is enough staff available to cover the courses. One of the issues that teachers mentioned during the interview, is the lack of teaching assistants. The panel encourages the programme to explore the option of using teaching assistants for the practical parts of courses.

The panel states that the **teaching and learning methods** are varied. Theoretical and interactive lectures are aimed at theoretical knowledge, whereas (computer) exercises, seminars, homework assignments, reports and project work are used to develop practical skills. The panel appreciates that the earlier team teaching problems have been addressed. Specifically, a course coordinator keeps the overview and is responsible for the exam, the number of teachers per course is limited to three, the specific expertise of each teacher is optimally utilised and teachers seem to work together to make sure that their part of the course fits with the other parts. During the interviews, the panel gets the impression that the mix of learning and teaching methods is well received by the students. The panel finds that the workload of each course is in line with the number of course credits, as there were no remarks from the students concerning this topic. The learning materials are sufficient.

The programme management has made an explicit choice to be more on the conceptual side of the spectrum, meaning that there is an emphasis on the principles, the formal aspects and the deep foundations of bioinformatics. The panel values this choice, but notices that, besides the thesis, there's only room for one relatively small integrated project (4 credits) in the third semester of the programme. During this project students apply their developing bioinformatics skills while learning to function in a multidisciplinary team. Leadership, project management, research and presentation skills are trained and assessed in the project. To better prepare students for the job market, the panel suggests that the programme should pay more attention to the integration of practical skills by increasing the time spent on integrative projects or by implementing an internship.

According to the self-evaluation report, internationalisation in the programme occurs mainly through active recruitment of international students, resulting into 25-30 applications per year from non-EU countries and 10-20 from within the EU. About one third of the international applicants actually enrol. In comparison, the programme attracts 5-10 Flemish students per year.

During the courses, the students are obliged to form mixed groups with students of different nationalities to encourage contact between students from different countries. The panel was enthusiastic to learn that the diversity of students is brought into the programme as an added value. Outgoing international mobility is more limited, which can be explained partly by the large proportion of foreign students, who are less inclined to go abroad after arrival. At their own initiative, a few students have performed their thesis work abroad (UK and the Netherlands) or decided to go on an Erasmus exchange programme. The Faculty of Bioscience Engineering is involved in the Global Engineering Education Exchange programme and actively encourages exchanges with the University of Stellenbosch. The panel and the students are positive about the available options for internationalisation.

After the previous assessment, the programme has improved its admission policy. The panel observes that the stricter criteria applied in admission seem to have helped improve the average student level. For Flemish students, the bachelor's degree gives direct access to the programme. For international students, admission is based on course transcripts, English proficiency and a motivation letter. The admission rate is ca. 70%, half of this percentage actually enrols in the programme. All students are expected to have mathematics skills at a sufficient level and to have affinity with quantitative methods, as proven either by transcripts or a 'Graduate Record Examination' on quantitative reasoning. An online orientation test assesses the incoming students' level in various scientific disciplines, allowing the programme to recommend particular reorientation courses during the first semester. Statistics show that the criteria changes have resulted in a doubling of the percentage of students with 100% study efficiency after one year from 33% in 2013-2014 to 71% in 2016-2017. The results on the orientation test correlate well with the study success of students.

The panel finds that the services, facilities and infrastructure, as provided by the programme, are appropriate to fit the needs of the students. Programme-specific study guidance is covered by the study advisor. The reorientation package ensures all students reach the necessary, basic level in biology, mathematics and information technology before advancing to the bioinformatics courses. While checking the infrastructure, the panel finds there are sufficient resources. For example, students can get access to a well-equipped data centre. The panel applauds the impressive High-Performance Computing infrastructure that they inspected during the visitation.

To conclude, the panel states that the programme provides a **coherent** educational environment, in which students can achieve the targeted learning outcomes. The most important recommendations of the previous assessment panel (2016) have been addressed. The curriculum has been revised and is now well structured. The learning outcomes, the learning content, the learning activities and the thesis approach are more tailored to the Engineering and Bioscience Engineering major. Ethics has a clear place in the curriculum, team teaching is better organised and students can use capable computing servers for their projects and master's theses. The panel is aware of the constraints imposed by the government, the university and the faculties involved. The fact that the programme spans several faculties means that course organisation is difficult (e.g. credits per course and scheduling). University-wide standards would be useful in this regard. Also, a need is felt for teaching assistants. Despite these remarks, the panel is convinced that the programme director and the academic staff have done an outstanding job to improve the quality of the programme, as evidenced by student satisfaction (during interviews and in evaluations). Therefore, the panel evaluates GQS 2 'Educational learning environment' as satisfactory.

#### **GENERIC QUALITY STANDARD 3: OUTCOME LEVEL ACHIEVED**

The assessment panel evaluates the outcome level achieved of the Dutch and English variant of the Bioscience Engineering major of the Master of Science in Bioinformatics as satisfactory.

The assessment panel evaluates the outcome level achieved of the Dutch and English variant of the Engineering major of the Master of Science in Bioinformatics as satisfactory.

#### Assessment 2016

The panel stated that the objectives, content and criteria of the master's theses were not related to specific engineering competences. The panel considered it necessary that the theses in these majors should be assessed against specific criteria to ensure that students achieve the necessary engineering competences. Another point of attention was the lack of information regarding employability after graduation, as well as the limited contacts with the professional field. Consequently, the panel evaluated GQS 3 'Outcome level achieved' as unsatisfactory for both majors.

#### Reassessment 2019

Concerning student assessments, the programme is covered by KU Leuven's general policy on assessment and the assessment policy of the Faculty of Bioscience Engineering. The faculty is responsible for developing a more concrete vision on assessment and the practical organisation of assessment, in line with the KU Leuven guidelines. Lecturers are trained in reliable, valid and transparent assessment through the course 'Teaching at KU Leuven'. The quality of assessments is monitored by the POC and the student evaluations. The learning goals of each course are clearly communicated to students (e.g. in the ECTS-files, during the first lecture, on Toledo). The panel appreciates that teachers receive training in evaluation and grading, organised by the faculty and by the Educational Development and Professionalisation Service of the KU Leuven.

The programme uses a variety of assessment methods across the different courses, such as written exams, oral exams, practical work, assignments, reports, presentations, project work and the thesis. During the site visit the panel reviewed the exams of some courses. In the panel's view, the exams are well designed to evaluate if a student achieves the learning goals.

The master's thesis forms the final part of the programme. Students can choose between topics suggested by lecturers or they can choose a topic themselves. The programme managers checks if the chosen topic fits the learning outcomes. Many theses involve a collaboration with a research group inside or outside KU Leuven. After selecting the topic, each student writes a research proposal. In the middle of the year students work out a midterm presentation. The daily supervisor and the supervisor assess the student continuously during the thesis work and provide feedback. A jury, consisting of the supervisors and two independent staff members who are not involved in the research, assesses the written thesis and the oral defence.

The previous assessment panel remarked that the targeted learning outcomes of the (Bioscience) Engineering master's theses did not align with the specific engineering profile of the (Bioscience) Engineering students/graduates. The programme has made several improvements regarding the strong recommendation of the previous panel to make a clear distinction between the theses in the Science major and the theses in the (Bioscience) Engineering major. The first improvement is the focus of the theses in each major. Science students are expected to apply bioinformatics methods to solve a biological or biomedical research question, whereas (Bioscience) Engineering students are expected to develop a new bioinformatics methodology or a software tool/database/ environment that serves bioinformatics purposes. Both staff and students experience differences between the majors that coincide with the intended learning outcomes, as evidenced by the interview with the students, the interview with the teaching staff and student evaluations. The programme communicates transparently about this difference in the ECTS-files and in an information session about the theses. The second improvement is the fact that thesis students are now guided by a supervisor from the corresponding faculty. Thirdly, an assessment form, containing all assessment criteria, has been developed to guarantee that the specific engineering competences are checked during the assessment.

Based on the reading of 12 master's theses, the panel observes that the quality of the theses is high and marks are fair. In spite of the positive judgements above, the panel believes that the programme still has some work to do. The learning goals and the assessment of theses now differ between the Science major on the one hand and the (Bioscience) Engineering major on the other, but the panel also recommends to make the distinction between the Engineering major and the Bioscience Engineering major clearer. The intended learning outcomes for both majors separately should be formulated better. Another suggestion of the panel is to revisit the thesis assessment form and separate the process (how did the student perform?) from the product (how well was the thesis written?).

The panel is satisfied with the employment rate of graduates. According to the programme management and based on VDAB statistics (the public employment service of Flanders), the graduates from the two engineering tracks all get employed easily, either as an employee or as a PhD student. Many students go on to PhD positions and obtain competitive research funding (FWO). During the interview the students and alumni were very positive about their options after graduation. To provide a good overview of employment possibilities after the study and to better prepare students for the job market, the panel offers a few suggestions. For example, it may be useful to help the student bodies of the involved faculties with the organisation of their job fairs, so bioinformatics students could be targeted specifically. Also, company representatives could be invited for guest lectures or the programme could make an internship part of the curriculum.

In conclusion, the panel states that the programme responded well to the recommendations of the previous assessment panel (2016). The objectives, content and criteria of the (Bioscience) Engineering master's theses are now related to specific engineering competences. Also, according to the panel, the quality of the master's theses is good. Nevertheless, the panel advises the programme to further clarify the distinction between Engineers and Bioscience Engineers. The panel observes that graduates easily get access to the job market and/or PhD studies. In general, the panel finds that the programme has an appropriate system of assessment, testing and examination and demonstrates that the targeted learning outcomes are achieved by the student. Students learn and acquire competencies in the programme that enable them to continue successfully in a scientific environment as well as in companies. Therefore, the panel evaluates GOS 3 'Outcome level achieved' as satisfactory.

### FINAL JUDGEMENT OF THE ASSESSMENT PANEL<sup>1</sup>

	GQS 1 Targeted outcome level	GQS 2 Learning environment	GQS 3 Outcome level achieved	Final opinion
Master in Bioinformatics Major Bioscience Engineering (Dutch and English programme)	S (2016)	S (2019)	S (2019)	S (2019)
Master in Bioinformatics Major Engineering (Dutch and English programme)	S (2016)	S (2019)	S (2019)	S (2019)

As generic quality standard 2 and 3 are evaluated as satisfactory in the reassessment and given the positive judgement of generic quality standard 1 after the previous assessment (2016) the final judgement of the assessment panel on the Master in Bioinformatics (major Bioscience Engineering and major Engineering) is satisfactory.

<sup>1</sup> The generic quality standards are assessed according to a two-point scale: satisfactory or unsatisfactory.



# **APPENDICES**

### **APPENDIX 1**

Curriculum vitae of the members of the assessment panel

Prof. dr. Jaap Heringa is full professor of Bioinformatics and director of the Centre for Integrative Bioinformatics (IBIVU) at Vrije Universiteit of Amsterdam. Heringa has set up a master's programme in Bioinformatics in 2003 as has been its programme director until 2018, where the programme was converted into a joint-programme master in Bioinformatics and Systems Biology in 2011, and subsequently into a joint-degree programme with the University of Amsterdam (UvA). He continues to be actively involved in teaching and coordination of the programme. Heringa has been scientific director of the Netherlands Bioinformatics Centre (NBIC) from 2009-2013. He has served as deputy Head of Node of ELIXIR-NL from 2013-2016, and is Head of Node as of 2016. Since 2014 he is director of the Netherlands Bioinformatics & Systems Biology Research School (BioSB). He has been editor of Computational Biology and Chemistry from 2014-2018, and as of 2019 is executive editor of Molecular Data Science. In August 2018 he became head of the Department of Computer Science at Vrije Universiteit. His current research interests revolve around formal modelling strategies, new sequence analysis strategies, protein structure and interaction prediction, cancer-related data integration, and semantic web-based data stewardship and data-tools interoperability.

Prof. dr. ir. Dick De Ridder heads the Bioinformatics Group at Wageningen University, The Netherlands. His research is on data-driven bioinformatics, concerned with developing and applying computer algorithms and models to study the living cell at the molecular level, based on high-throughput measurements. He collaborates with leading scientists in plant and microbial biotechnology as well as with industry, in a number of research projects. He has developed and lectured several courses in bioinformatics and data science at the BSc (including a minor programme), MSc and PhD level and currently heads the education committee of the Netherlands Bioinformatics & Systems Biology research school.

Prof. dr. Anders Krogh is a professor of Bioinformatics at the University of Copenhagen, Denmark. Originally a physicist, he moved into bioinformatics very early and pioneered machine learning and statistical modelling in analysis of proteins and DNA. He has also worked in many areas of applications ranging from protein structure prediction to cancer diagnosis. In recent years, he has focused on analysis of data from new high-throughput DNA sequencing technologies. He has been responsible for establishing a Master's program in bioinformatics at the University of Copenhagen in 2002 and is still actively involved in teaching and coordination of the programme. Reza Afkhami is a master's student in Biology at the VUB university. He has practical experience in computer science for four years and he is familiar with subjects such as computer networking, implementing computer networks on Microsoft windows server, Linux command line, R and Python programming languages. He is starting his master thesis in a bioinformatics topic and wants to do his PhD in this field.

# APPENDIX 2 Time schedule of the site visit

### Tuesday 26/3/2019

16:30-18:30	internal consultation and examination of the documents
19:00	dinner (panel)

### Wednesday 27/3/2019

09:00-9:30	internal consultation
9:30-10:30	programme management
10:30-11:00	internal consultation
11:00-11:50	site visit facilities
11:50-12:50	students + alumni
12:50-14:30	lunch and internal consultation
14:30-15:30	teaching staff
15:30-16:30	consultation hour / internal consultation
16:30-17:00	programme management
17:00-17:30	internal consultation
17:30	oral reporting