HAN_UNIVERSITY
OF APPLIED SCIENCES

Degree Statute and Education and Examination Regulations for the master's programme

Molecular Life Sciences

Degree format: Full-time/Part-time

2019-2020 academic year

Date of last adoption by programme council	4-7-2019
Date of last adoption by institute council	26-6-2019
Date of last adoption by degree committee	10-5-2019

HAN_UNIVERSITY OF APPLIED SCIENCES

Parts 1 and 2 have their own tables of contents.

HAN_UNIVERSITY OF APPLIED SCIENCES

Education and examination regulations (part 1) of the Master programme Molecular Life Sciences

Instituut HAN Masterprogramma's

Academic year 2019-2020

Date of last adoption by the HMP programme council	04-07-2019
Date of last adoption by institute council	26-06-2019
Date of last adoption by degree committee	10-05-2019

HAN_UNIVERSITY OF APPLIED SCIENCES

Table of contents

HAN_UNIVERSITY OF APPLIED SCIENCES

1 About the Degree Statute (DS)

The Higher Education and Research Act (hereafter referred to as “the Act”) stipulates in article 7.59 that an institute such as HAN University of Applied Sciences is obliged to adopt and publish a Student Charter.

At HAN, the part of the charter which applies to all students, i.e. the institution-specific part, is called the Student Charter. You can find the Student Charter and all its accompanying regulations on the HAN website: http://studentenstatuut.han.nl.

At HAN, the degree-specific part is called the Degree Statute (DS).
The Degree Statute consists of five parts:

- Part 1: General part (Degree Statute)
- Part 2: The Education and Examination Regulations (EER), which defines the education, final assessments and examinations of your degree programme
- Part 3: Regulations of the Board of Examiners
- Part 4: Regulations of the Exams Office
- Part 5: Regulations of the Degree Committees.

Note Part 1 is purely informative. No rights can be derived from it. Rights and obligations are derived from the other parts; these are legally applicable regulations.

1.1 Who is this Degree Statute for?

This is the Degree Statute for the following degree programme (full-time/part-time) at HAN University of Applied Sciences (BRIN number: 25KB: The Basisregistratie Instellingen (BRIN) is a database for educational institutions that is published by the Dutch Ministry of Education, Culture and Science. It contains all schools and related institutions. Each educational institution is identified in the database with a number, the so-called BRIN number.)

Name	Academy	CROHO	Title after the programme
M Molecular Life Sciences	Instituut HAN Masterprogramma's	49293	Master of Science

This Degree Statute contains information on the structure, organisation and execution of the degree programme, the student facilities, counselling and personal tutoring, the EER and the programme-specific regulations that describe student rights and responsibilities.

1.2 How do you read this Degree Statute?

1. We use regular UK spelling rules.
2. When we refer to ‘you’, we mainly mean you as an internal or external student enrolled in these degree programmes at HAN University of Applied Sciences. We also refer to others, such as prospective students.

1.3 How long is the Degree Statute valid for?

Each academic year the departments at HAN University of Applied Sciences make a new Degree Statute (DS) and a new Education and Examination Regulations (EER). The DS-EER for a certain academic year applies to everyone who is enrolled in that degree programme for that academic year. It does not matter which phase of your degree programme you are in, whether you are an internal or external student, nor when you started. You can find your DS-EER here: https://onderwijsonline.han.nl/elearning/lesson/Kqe0Kd4D.

This DS applies to the 2019-2020 academic year: from 1 September 2019 to 31 August 2020.

For students starting their degree programme on 1 February 2020, two different DS-EERs apply consecutively during their first “year”: the current one and that of the next academic year (but the differences are mostly small).

Did you enrol in a previous academic year for the degree programme? And is the degree programme working with a renewed curriculum or modified EER regulations? You can read how this is organised in chapter 8 (Transition Regulations) of the EER.

1.4 How are the DS and EER compiled?

The Degree Statute for the programme is drafted each year based on the Model DS/EER: a model that applies for the entire HAN. It is adopted by the HMP Programme Council / Faculty Board. The model is always based on the Model DS and the Model EER of the current academic year.

The HMP programme council exercises the participation rights on the EER and DS, but only in so far as the HAN Participation Council has not already exercised these rights through the Model EER and in so far as these rights have not been conferred to the degree committee. How this exactly works is set out in the Regulations of the HAN Participation Council and the Regulations of the Degree Committee.

The advice of the degree programme’s board of examiners is requested in advance.

The relevant HAN organisational bodies strive to publish the new DS and the new EER before 1 June.

HAN_UNIVERSITY OF APPLIED SCIENCES

2 Education at HAN

Your degree programme is part of the educational offerings of HAN University of Applied Sciences. HAN has an overarching vision on higher education. Your degree programme embodies this vision in its own way. This chapter describes HAN's mission, vision and culture.

2.1 Mission

At HAN we educate you in such a way that you are optimally prepared for your future or current profession. But that is not the only goal of our education. Other goals are for you to continue developing your social awareness and for you to be able to contribute to innovation in a complex, dynamic and international society, now and in the future. We have subdivided this mission as follows:

- We want to give you a good ***Qualification*** for your future profession.
- As a professional, you never work alone, but always in collaboration with others. We call that educating you as a ***Network Professional***. As a result, you learn to work well with others and across borders. You also learn how you as a professional relate to the historical context of your field. This gives you insight into what is expected of you now and in the future.
- We want to offer you a challenging programme at ***Masters level*** where you can learn to address problems in a systematic, solution-led manner supported by applied research.
- We want to contribute to your ***Personal Development***, so that you grow as a professional and pursue lifelong learning. After all, your knowledge and skills are the basis of your profession, but who you are, your qualities and your approach make the difference.
- We want you to learn a sense of social responsibility, ethics and citizenship for your profession; to learn that you have to mean something for other people in your profession. This is often indicated with the term ***Bildung***.

2.2 Vision

We achieve these goals together with you. Below you can read how.

- ***You learn in context***. You get experience in practice. That helps you to understand the complexity of your work. Learning is not something you do on your own. Your lecturers stimulate learning with and from each other.
- ***You learn in the triangle of education-research-professional practice***. You conduct research, for example on the quality of work in the professional field of your choice, or on the possibilities for innovation. This allows you to contribute to the development of your profession. Also, in the case of new developments, you can quickly adapt to what is needed to perform your work optimally.
- HAN University of Applied Sciences has a large number of ***research groups***. These groups account for the research at universities of applied sciences. They are also involved in the degree programmes. You can, for example, get research experience within a research group in collaboration with the professional field. You can find all the research groups on our website: www.han.nl/onderzoek/kennismaken/lectoraten.
- ***Personal tutoring and the student as partner***. You are assigned a Student career coach for the full duration of your studies. At HAN we want you as a student to feel acknowledged, seen and heard. We also involve you in the organisation of the degree programme. This is what we call ‘student as partner’. Each department has the freedom to organise its education in such a way that it suits you as a student and the degree programme. You can read more about this in part 1 chapter 3 and part 2 chapter 4.
- ***Education with options***. Besides your regular study programme, we also give you various options to choose from. For example, you can choose a work placement location. The options depend on your degree programme. You can read more about these options in the EER. In addition, we stimulate you to get research experience, for example, at the research groups of HAN University of Applied Sciences in an innovation lab or at a workplace learning location. For advice on your choices, go to your lecturers and other HAN advisors.
- ***Internationalisation @home or abroad***. During their studies, all HAN students get to experience the international context of their field. Read more about this in part 1 chapter 3.

2.3 Quality culture

HAN University of Applied Sciences fosters a culture of quality. A culture in which everyone in some way contributes to high-quality education and a smooth running organisation. Below you can read how.

2.3.1 Highly qualified staff

Our lecturers are highly educated. Many of them have worked in the professional field for which they are educating students. Others have research experience relevant to this field. Over 80% of the lecturers you encounter during your studies have a PhD degree..

The lecturers also have good teaching skills, which they acquired through training. This means they know how to guide you properly in your learning. The examiners also have the necessary qualifications. All our support staff are also properly trained in their fields. They all perform high-quality work.

Because our departments collaborate with our research groups, researchers and professors are also involved in education. This helps you to further develop your own inquiring attitude, for example. The research group also allows you to discover the latest research results and innovations in your field.

2.3.2 Stimulating growth and an attitude of learning

We want you to grow so you can successfully complete your studies. This is not achieved simply through supervision. We also challenge you to get the most out of yourself and we train you to become ever more independent in your studies. We stimulate you to be proactive in your studies and we help you to continue developing your professional work attitude. You can expect your lecturers to be available and respond to your questions quickly and clearly. You can also ask for support when you are falling behind or when you are willing and able to do more. Read more about this in the EER.

2.3.3 Responsible for quality

Each degree programme has a quality plan. This plan, but also the EER, describes how students evaluate the education and indicate what needs to be improved. It also describes how students are closely and actively involved in improving their degree programmes. Student involvement and participation are important to us. But it is even more important that staff members, students and the professional field related to your degree programme, each in their own way, are involved in or take responsibility for the degree programme and HAN as an institution. For example, for the quality of lectures, timetables, the curriculum, supervision at your work/placement organisation, examination and other forms of renewal and improvement.

We invite you, as a student, to play an active role in this. This attitude will also be important in your work. So we also regularly ask you for your opinion on the programme. We do this in (digital) surveys, an annual national student survey, and in oral evaluations in class at the end of a period. We also invite you to actively collaborate on renewal and quality improvement. For example, by improving the content and exams of the degree programme or improving logistical or organisational points: together with lecturers and/or support staff.

We also reflect on how we organise our education and research, on who we do it for and why we do it in the way we do. We check our conclusions regularly with all involved parties; This means you, but also lecturers, researchers and professionals from the field. Every 6 years each degree programme is officially monitored by the NVAO (Accreditation organisation of the Netherlands and Flanders).

2.3.4 Inspiring and interactive environment

We want you to be inspired by your degree programme. For example, by getting the latest information on developments in your field. And we always try to create an open, interactive, safe and familiar learning environment. We encourage everyone to give each other honest feedback.

HAN_UNIVERSITY OF APPLIED SCIENCES

3 Information about your degree programme

3.1 Mission and vision of your degree programme

The professional field of our master programme is the bioscience sector. This sector branches into pharmaceuticals and biotechnological companies, molecular research and diagnostic departments at (academic) hospitals, and university research groups who are active in applied or translational research and product development. This HAN Master in Molecular Life Sciences is a Professional Master that is specialised in applied/translational research and product development in the bioscience sector. The programme is strongly focussed on combining the laboratory and technical skills students previously acquired with competences required for managing projects within the bioscience sector. Therefore, the focus and characteristics of a Professional Master graduate will be different in comparison to the academic Master graduate (See figure 1).

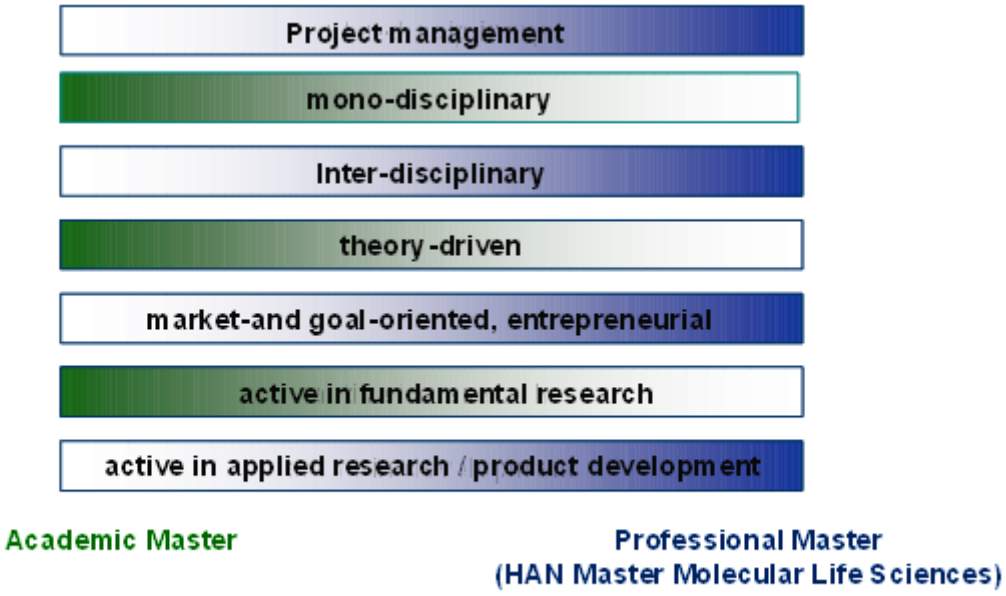

Figure 1. The figure illustrates the characteristics of the Academic Master (green) compared to the Professional Master (HAN Master in Molecular Life Sciences; blue) in the area of Life Sciences (which includes the bioscience sector).

The Master in Molecular Life Sciences graduate has a profound knowledge of biochemistry and of molecular and cell biology of prokaryotic and several eukaryotic organisms, thereby being specialised to perform Bioscience-related projects. Moreover, being trained in project management, interdisciplinary thinking and communication, in combination with an entrepreneurial focus (such as patent searches and business development), the HAN Master in Molecular Life Sciences is prepared for a role in applied research and product development phase in industry, or in applied/translational research in research institutions of the bioscience sector.

Social and organisational context

As indicated in figure 1, the HAN Master in Molecular Life Sciences graduates is prepared for working in different stages of the business pipeline that the bioscience industry uses for product development. As such the HAN Master Molecular Life Sciences programme takes in a unique position in the master programmes offered in the Netherlands. It serves the industry need for interdisciplinary, goal- and market-oriented professionals specialised in applied

research and product development of both biotechnology companies as well as research institutions active in applied/translational research.

The Master Molecular Life Sciences graduate can be employed at:

1. Companies active in biotechnology, in fields such as pharmacy, personal health care, diagnostics, food- and feed industry etc. These can be small and medium enterprises as well as multinationals.
2. Research institutions such as universities, hospitals or governmental/private (contract) research institutes.

Examples are:

1. MSD, MSD Animal Health, DSM, DuPont, Synthon BV, Batavia Biosciences, Qiagen, European Veterinary Laboratory, QM Diagnostics.
2. TNO, NCMLS, NKI, Universities and (University) Hospitals.

Aim of the programme

After graduation, the professional Master in Molecular Life Sciences (MMLS) is able to apply and translate knowledge to plan, realise innovative and/or implement projects of at least three months in the bioscience industry.

3.2 Content and organisation of your degree programme

Interfaculty Institute of HAN Master Programmes (HMP)

Most HAN Masters programmes are part of the interfaculty institute of HAN Master Programmes (HMP). Only the Master programme Engineering Systems falls directly under the responsibility of the Faculty of Engineering. Combining most Masters programmes in one institute offers the possibility to sharpen the profile of the professional Masters degree programme, both within and outside HAN.

Incorporation in one organisational entity also makes it possible to gear the Masters programmes better to one another and create synergy advantages in content and business economics, in both the front and back offices of the Masters degree programmes. And, last but not least: the institute offers the opportunity to develop more unambiguity and standards in relation to the quality of education, research and such like on the basis of a clear concept.

The HAN Masters programmes accredited by the Accreditation Organisation of the Netherlands and Flanders (NVAO) have several distinctive characteristics.

First of all, the value attached to the link between the profession or practice and the programme. This emerges clearly from the requirements set for students' practical experience (post-experience character) and the use of recognisable selection criteria for students who want to study at HMP.

Another distinctive aspect is the close relationship and connection between the education, professional field and organisations or businesses at which the student is employed. HMP also strives for a high-quality connection between practice-based research and education. It does so by way of the efforts and role that professors fulfil in the Masters degree programmes, but also by way of the requirements set for the work environment and graduation assignment.

HMP's basic standard for all this is the human scale, which for HMP means: small-scale, clear and with directly accessible lecturers and coordinators. The following mission statement was formulated for the interfaculty institute of HAN Master Programmes to guarantee their unique character:

HMP's MISSION:
By means of inspiring and current education, the interfaculty institute of HMP aims to deliver experienced professionals at Masters level who are able to tackle the complex problems at their organisations in a systematic, solution-led manner supported by applied research.

Management and organisation at faculty and institute level

The director of the interfaculty institute of HAN Master Programmes (HMP) is drs. E.H.M. Prevoo. The HMP management reports to the HMP Programme Council consisting of the (four) faculty directors of HAN.

The director of the Faculty of Engineering, responsible for the Master programme of Engineering, is dr. J.A. Hoekstra MSc.

Information about the structure, organisation and people at your education programmes and institute, as well as the faculty those belong to, can be found on: www.han.nl/insite

Management and organisation at programme level

The programme is designed and organised by a core team. The core team is responsible for continuity, content, cohesion and coordination of the education. The team is supported in this by the secretarial office, which is located in room 0.07 of the Institute of Applied Sciences (on Mondays) and can be reached via 024-3530586 on all other work days.

The core team of the Master's degree programme is composed of the following members:

Andrea Thiele (PhD), coordinator

Remko Bosch (PhD), responsible for curriculum

Marloes Vissers (PhD), member of the examination committee

Hans Visser (PhD), industry member

3.3 How we educate and supervise

Good higher professional education is attuned to the developments in society and the professional environment. We are in close communication with potential employers to monitor what they demand and desire in a graduate. With that goal in mind we offer a programme with a very distinctive and unique character attuned to market demands to prepare best for the job market.

We are convinced that learning in the professional context is most effective. Therefore, we value the central role of professional practice in our education and we have made learning through performing professional tasks the key principle of our curriculum. Professional tasks are meaningful and complete tasks, as complex as those that are performed in the 'real' working environment by a professional (expert). 'Complete tasks' means that students will work on projects in their entirety, not on parts thereof. In our curriculum, this is realised in two ways: firstly, by learning in professional practice (workplace learning) and secondly by learning on project cases. Learning in professional practice implies that student work on projects within the product development pipeline in bioscience in practice and in this, develop from project member to being responsible for a project.

The 'projects cases' that we have selected are represent different product development pipelines present within different areas of the bioscience industry. In our programme, projects are defined as course units and all assignments within a particular course unit represent professional tasks belonging to one project. This means that multiple competences will be addressed in each course unit. We aim to acquiring the necessary set of competences with accompanying knowledge that are immediately and sustainably profitable for both students and their respective employers. Our defined set of competences, supported by a number of criteria (indicators), are the scaffold of our

programme and the student's activities are always reviewed using the indicators as reference. The competence training is placed in the context of our so-called Body of Knowledge and Skills (BoKS). Both the competences and the BoKS are regularly reviewed and verified by representatives of the professional practice. We provide lectures, workshops, trainings, current literature and feedback by experts to support students in realising assignments (representing professional products) to complete a task (see figure 2). In doing so we ensure proper development of skills and attitude with accompaning Body of knowledge for all students. This way of active learning in the professional context enables students to apply their competences and knowledge in other situations and projects at their work place.

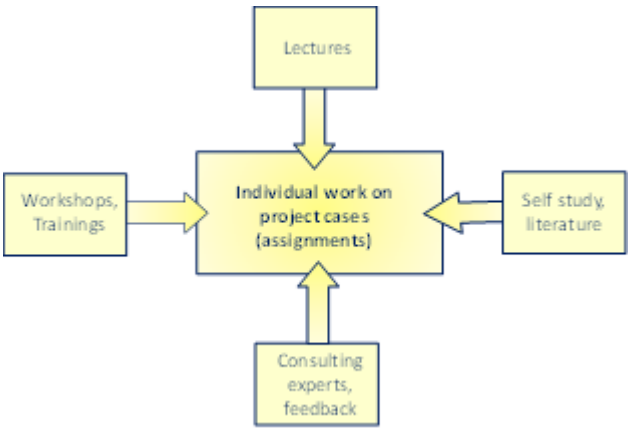

Figure 2. Schematic presentation of the case-based education of the Master in Molecular Life Sciences education programme. Assignments related to the professional practice are central in the learning process and supported by lectures, workshops, trainings, the literature and feedback by experts.

In the final module (major project), all competences are integrally applied and all individual indicators are reviewed and must be assessed sufficient. This is done through an integral assessment in which a project proposal, the project work, the master thesis, and the presentation and discussion are evaluated by a group of examiners. As such, a graduate will demonstrate that he/she has required all the competence indicators that belong to our professional master in molecular life sciences.

International orientation

An undeniable feature of the bioscience sector is the many collaborations across borders and the international composition of staff. In accordance, the Master MLS is entirely offered in English and students are from various countries. The curriculum structure represents the professional practise, and therefore the degree programme intrinsically applies international standards and competences.

3.4 Internships

Full-time students spend 3 days a week working as an intern in a laboratory at either a company or institute during the first three semesters of the programme. The other 2 days are used for attending lectures and other study activities. Semester 4 is dedicated for the graduation project during which students spend 5 days a week as an intern.

3.5 Workplace learning

Part-time students can combine the theoretical programme with learning at their own workplace.

3.6 How the professional field is involved

professional advisory committee

In monitoring the quality of the programme, HAN attaches great importance to the opinions of experts from the professional field in question. These experts meet at least once a year in the meetings of the professional advisory committee.

The professional advisory committee consists of the following members:

- Henny Hofs PhD (Pharmaceutical Consultant & Toxicologist), PSDD, Nijmegen
- Frank Preijers PhD (Stem Cell Laboratory Director), Radboudumc Nijmegen
- Nienke Vriezen PhD (Head Upstream Biotechonology), Synthon
- Martijn van Hal MSc (Director Operations), MSD
- Riet Hilhorst PhD (Senior Scientist), PamGene
- Markus Mueller PhD (CEO), BioEcho (Germany)
- Jan-Paul Favier PhD (Director) CLS Services

External supervisor

External supervisors are appointed to monitor and assess the quality of the final assessment.

Assessing the quality of the final assessment concerns in particular:

- the quality of examinations and assessment
- the quality of students (realisation of intended exit qualifications)
- the quality of the organisation of the final assessment.

The external supervisor is: Drs. Paul Smeets

External Advisor

The External advisors are chosen from companies or institutes of the biosciences sector. The External Advisor has an advising role for the assessment of the candidates for the Master’s degree. The External Advisor has the following tasks:

- Judges the final report and presentation based on the assessment criteria.
- Formulate questions based on the Graduation Project thesis and presentation.
- Advises about the final assessment.
- Gives feedback on the final assessment with respect to content and process.

3.7 Research groups

Research groups relevant to the programme

The following research groups and professors are involved in the programme. An explanation is also given of the way in which research groups contribute to the programme's knowledge development:

The research centre Biodiscovery is active in research and development in biotechnology. Expertise are bioinformatics, molecular biology, (bio-)chemistry, (bio)analytical chemistry, fermentation technology and downstream processing. Current projects focus on efficient protein production using micro-organisms, on microbial oil production, development of tools for biorefineries, on the identification of new antimicrobial compounds, and on using *C. elegans* as a screening system for various compound activities (e.g. toxicity). The contract research

organization HAN BioCentre is part of the research centre Biodiscovery.

The research centre Biodiscovery consist of the following members:

- Christien Lokman, PhD (Lector)
- Christof Francke, PhD (Associate lector, Project leader)
- Richèle Wind, PhD (Research coordinator, Project leader)
- Philip de Groot, PhD (Project leader)
- Ruud Heshof, PhD (Project leader)
- Karin Struijs, PhD (Project leader)
- Samantha Hughes, PhD (Project leader)
- Dennis Lamers, Ing (Research member)
- Sefanne Hakken, MSc (Research member)
- Bram Visscher, BSc (Research member)
- Laurens Kirkels, MSc (Research member)
- Marije Lam (secretary)
- Elly van der Zwart (administrative support)

Staff of the research centre is structurally involved in the master programme:

Richèle Wind, Christien Lokman, Karin Struijs, Dennis Lamers, Ruud Heshof and Christof Francke are lecturers and advisers of the master programme.

The module Production of Biomolecules is directly related to research activities of the research centre Biodiscovery.

Further, some students of the masters course combine the study with an intership at HAN BioCentre. They can apply the knowledge and skills acquired in the master programme in their intership as research member/technicians, and *vice versa*, the master course helps them to fulfil their role in the dynamic research environment in applied research for industrial clients.

3.8 Options in your degree programme

Not applicable.

3.9 Quality assurance of the degree programme

The aim of quality assurance within the Masters degree programme is to work continuously on improving and guaranteeing quality. Quality assurance is carried out according to the parameters drawn up by the HAN University of Applied Sciences and elaborated for the Masters programmes in the "*HANdboek Kwaliteitszorg Onderwijs*", 2011, update 2015 (HANdbook of Quality Assurance in Education).

Different stakeholders, which are students, professional field (professional advisory committee, the HAN Research group Biodiscovery and diverse other contacts), lecturers and alumni are involved in the quality assurance cycle. They are formally asked about their opinion about various quality aspects of the programme on a regular base, and are stimulated to give informal feedback. Evaluation scores are compared to targets. Possible causes for scores lower than targets are discussed, and improvement actions are initiated, carried out, communicated and evaluated. By continually going through Deming's Plan-Do-Check-Act cycle (PDCA cycle), the programme aims for continuous improvement of the quality of the programme.

In addition, the external supervisor has the task to give feedback on the realization of the final qualifications, their assessment and teaching supporting students in acquiring these.

The quality assurance system of the Master Molecular Life Sciences is described in the annual

“Kwaliteitszorgrapportage” of the programme.

3.10 Extra contribution

Not applicable

HAN_UNIVERSITY OF APPLIED SCIENCES

4 The exit qualifications for your degree programme and professional requirements

The professional field of our master programme is the bioscience sector. This sector branches into pharmaceuticals and biotechnological companies, molecular research and diagnostic departments at (academic) hospitals, and university research groups who are active in applied or translational research and product development.

Aim of the programme

The aim of our programme is to educate masters that are able to plan and control a project(*) in applied research and/or product development in the bioscience sector.

(*) Projects can also be parts of projects and have a length of at least 3 months.

Professional tasks:

The meet this aim, we have discerned three professional tasks for our Professional Master in Molecular Life Sciences:

1. to understand practical, economic, social and/or ecological needs of businesses, market and society that can be anticipated by biotechnology;
2. to apply fundamental knowledge in the area of molecular life sciences to find sustainable solutions for these needs;
3. to implement such solutions in a successful and efficient way by organizing their realisation in projects, considering the interdisciplinary dimension and communicating with different experts. Such projects have a duration of at least three months.

4.1 The professional field

The professional master is responsible for the realisation of projects in applied research and product development. In this role, our professional master is of added value for organisations in the bioscience sector (companies, hospitals or the R&D institutions) as he/she supports senior project leaders by creating a short and effective link between company policies and hands-on projects operational at bench level. The Master in Molecular Life Sciences graduates can take position in the interphase between research/innovation and standardised processes (such as production, analysis and diagnostics). Such functions can be for instance scientific QC support or technical operations support. The function name of our masters varies within companies. Examples are Senior Researcher, Junior Scientist, Assistant Project Leader, Associate Project Leader or Junior Project Leader. Some graduates have decided to continue his/her career with a PhD project in applied or translational research or product development.

4.2 Professional requirements

Not applicable

4.3 Graduation specialisations

Not applicable

4.4 Exit qualifications and professional requirements

Competences

To apply and translate knowledge for the realisation of innovation and implementation of projects in the bioscience

sector, the Master in Molecular Life Sciences needs to have specified competences.

These core competences are defined in dialogue with representatives of the professional practice. The six competences are:

- Professional conduct and professional development.
- Designing strategies for applied research and product development
- Design, analysis and control of experiments
- Communication
- Managing Projects
- Advising

These competence indicators, together with the Body of Knowledge and Skills, form the final qualifications of the Master in Molecular Life Sciences.

The following section gives a more general description of the competences of the Professional Master in Molecular Life Sciences, and is compared with the Professional Bachelor graduates in the area of Life Sciences, and with the academic Master equivalent (see figure 3).

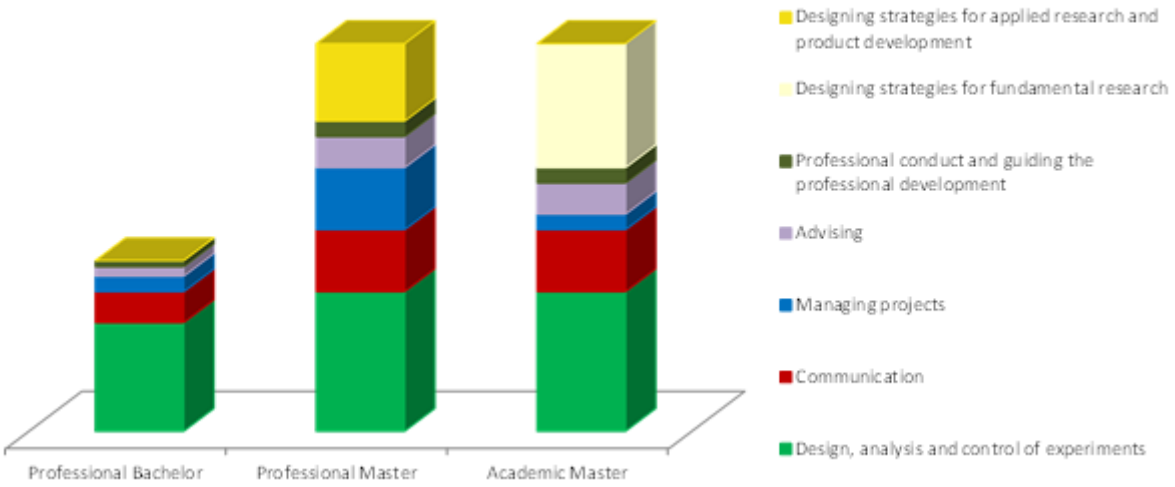

Figure 3. Schematic presentation of the competence profile of the Master in Molecular Life Sciences (a Professional Master) in comparison to the Professional Bachelor and the Academic Master in the field of life sciences. The characteristic Competences of the Master in Molecular Life Sciences are Designing Strategies for applied research and product development and Managing Projects.

The comparison of figure 3 shows that the two competences ‘designing strategies for applied research and product development’ and ‘managing projects’ are prominent competences for the Professional Master in Molecular Life Sciences. This in sharp contrast to the Academic Master programme in which designing (fundamental) research based on theory, curiosity and new ideas is key. Below follows an evaluation of the competences of our programmes and compares them with competences of the equivalent academic masters and bachelor graduates.

1. Graduates of all three type of programmes need to be professional in terms of being pro-active, team-oriented personalities who reflect on their own actions, deal with feedback and are open to learning. Both master graduates are expected to learn autonomously. While the academic master is mostly a theory-driven curious personality however, the professional master shows an entrepreneurial attitude. As the professional master functions at the interphase between different expertise, establishing a coherent network belongs to his/her professional conduct as well. In addition, we expect that masters are able to reflect on the quality of their projects, their own role in projects, and on their own professional personality.
2. Our Professional Master designs strategies for applied research and product development in a product-, goal- and market-oriented way. He/she understands practical, economic, social and/or ecological needs, He/she is aware of the information obtained by fundamental research, but also of other factors such as costs, competitors or the patent situation and uses this information to achieve the company aims.
3. The competence design, analysis and control of experiments is important for all programmes of figure 3. Professional experience will increase after graduation at bachelor level but master employees are expected to conduct design, analysis and control of experiments at a higher level of quality, complexity and independency compared to bachelor trained employees.
4. Communication is another competence necessary for both bachelor and master graduates. However, whereas bachelors communicate predominantly over their experiments within research groups, masters are expected to have professional written and oral communication skills enabling them to communicate beyond their own group. Moreover, while for academic master, communication occurs mostly with peers through publications and presentations, communication of the professional masters often occurs in an interdisciplinary context. Communication with experts of different fields such as biology, statistics, patents specialists, legal affairs or finance departments is important for the efficient realisation of entrepreneurial projects.
5. Managing Projects in terms of project aims, deliverables, value, risks, responsibility, communication time and costs is typical for the professional master. It is a minor competence of the bachelor graduate and of the Academic Master graduate.
6. In line with competence 4, the professional master mainly informs and advises about aims, multidisciplinary interest, project approaches and results to people within and outside their own department. In contrast, the academic master is able to provide argument-based advice about research projects to others. The Bachelor, in contrast, advises about lab equipment or experimental techniques within the research group.

Competences Professional tasks	Professional conduct and guiding professional development	Designing strategies for applied research and product	Design, analysis and control of experiments	Communication	Managing projects	Advising
to understand practical, economic, social and/or ecological needs of businesses, market and society that can be anticipated by biotechnology	x	x		x	x	x
to apply fundamental knowledge in the area of molecular life sciences to find sustainable solutions for these needs		x	x		x	x

to implement such solutions in a successful and efficient way by organizing their realization in projects, considering the interdisciplinary dimension and communicating with different experts. Such projects have a duration of at least three months.	x	x	x	x	x

Body of Knowledge and Skills of the Master in Molecular Life Sciences

Upon graduation, the student ...

Molecular biology (techniques)

- has knowledge and insight of genes, chromosomes, plasmids mutations/ SNPs.
- understands the principle of all standard techniques to detect DNA (such as Southern Blot, PCR, FISH, (next generation) sequencing), RNA (such as Northern blot, RT-PCR, expression array, RNAseq, in situ hybridization) and proteins (SDS-PAGE, Western blot, immunocytochemistry, immunohistochemistry, protein array, mass spec) and can apply the appropriate technique to answer a question about the presence, quantity or localization of DNA, RNA or protein.
- understands how gene expression is regulated in prokaryotes and eukaryotes and applies this knowledge to heterologous gene expression.
- is able to apply DNA and other recombinant technologies to manipulate gene expression.

Cell biology (techniques)

- has knowledge and insight of prokaryotic and eukaryotic cells, function of organelles, cell cycle regulation, DNA repair, signal transduction, protein modification and localization.
- understands the principle of techniques to analyze cell proliferation, cell cycle, apoptosis, protein modification and can apply these techniques to answer question on such cellular functions.
- has knowledge and insight of the molecular mechanisms that contribute to cancer development and can apply this knowledge for the design of cancer diagnostics and anti-cancer drugs.

Biochemistry (techniques)

- has knowledge and understanding of the physic-chemical properties of proteins, nucleic acids (DNA, RNA), sugars, lipids, endotoxin, salt, viruses and bacteria.
- is able to choose an analytical method based on the biomolecule(s) to be analyzed.
- has knowledge and insight of metabolic pathways, cell chemistry and biosynthesis and can apply this knowledge to optimize metabolite production (metabolic engineering).

Enzymes

- knows the industrial applications of enzymes.

Vaccine discovery

- has knowledge and understanding of the immune response to pathogens (action of innate and adaptive immune system, induction and effects of cellular and humoral immunity, mechanisms for induction of memory).
- understand the mechanisms by which micro-organisms can cause disease.
- knows different types of vaccines (such as attenuated, inactivated, subunit, recombinant, DNA), their mode of action and their advantages and disadvantages.
- is able to choose a vaccine antigen, adjuvant and administration route depending on the immune response that is required and on practical aspect.
- knows different vaccine production platforms, their advantages and disadvantages.
- is able to design experiments to test the potency of a vaccine.

Development of diagnostic tests

- knows different types of diagnostic tests, their principle of action and their advantages and disadvantages.
- is able to define the importance of sensitivity, specificity, and practical aspects such as costs, duration or required staff training based on the desired application of the diagnostic test.
- has insights in the principles, advantages and disadvantages of different diagnostic tests, e.g. serology and molecular diagnostics.
- is able to choose a type of diagnostic test based on the required specificity, sensitivity and practical aspects such as duration, requirement for staff training.

Drugs Discovery, Development and Delivery

- understands the principles of pharmacology, pharmacokinetics & drug-biotransformation, and pharmacodynamics.
- knows and understands drug design principles.
- Understand the procedures and principles involved in the preparation and structural analyses of unknown substances using UV, IR, MS, and NMR.
- is able to choose one type of drug as an active pharmaceutical ingredient depending on the desired biological effect.
- is able to choose a delivery system based on desired selectivity and bio-availability· is able to design a strategy to measure the bio-availability of the drug.
- is able to choose appropriate in vitro and in vivo assays to test the efficacy and the toxicology of a drug.
- knows with animal models can be used to test drugs, and the advantages and disadvantages of these models.
- knows the different phases of clinical studies and what is required to enter the clinical phase of drug development.

Quality assurance and quality control

- is able to define quality requirement for products and processes based on regulatory guidelines.
- is able to describe a target product profile and critical quality attributes· is able to design a strategy to validate a diagnostic test.
- is aware of the requirements for entering the clinical phase, and for market entry.

Process development and optimization

- knows the advantages and disadvantages of different production strains and is able to choose a suitable production strain for the production of specific proteins.
- is able identify critical parameters in the process.
- tests critical parameters in the production process (USP and DSP) and interprets the outcome.
- Is aware of the fact that scaling up or down requires process re-optimization.

Biobased economy

- Is able to explain the main principles of a biobased economy and its new technological challenges.

Statistics and experimental design

- understands the meaning of: statistical hypotheses, type of variable (continuous / categorical), association versus causation, confounding variables, variation, normal distribution, population versus sample, dependent and independent observations, Type I and Type II error, descriptive statistics, the relationship between central tendency (mean, median) and variance, p-value and statistical significance, log-transformation, one- or two-sided tests, multiple testing problems and its solutions.
- is able to translate the research question into an appropriate statistical question, experimental setup and corresponding statistical analysis.
- has awareness of power and sample size calculations.
- is able to determine the accuracy, sensitivity and specificity of a diagnostic test; and to understand ROC curves.
- is able to report the results with tables and graphics.

Bioinformatics

- Data Mining
- Sequence annotation (DNA and protein sequences)
- Sequence alignments and score matrices
- High-throughput data analysis
- understands the principle steps in analyzing high-throughput data obtained by –omics approaches.
- has analyzed and interpreted a limited number of high-throughput data and is able to communicate to specialists about such analyses.

Intellectual properties

- is aware of the rights derived from intellectual properties and understands which implications these have for the production of generics and biosimilars.
- is able to use patent databases to identify patent blocks.
- is aware that he/she needs to contact patent experts if he/she is not sure how to interpret patent databases.

Bio-business

- understands the meaning of the terms business models and business development, business value and financing.
- is able to translate his/her projects plans in a concise business plan.

Inter-personal skills

- is aware of his own cognitive style and recognizes the styles of team members.
- has insight in different factors that contribute to an effective communication process.
- knows the principles of situational leadership.
- knows how to deal with possible conflicts.
- is aware of intercultural differences.

When you graduate you conform with the exit qualifications of the degree programme. In other words, you have certain (required) knowledge, understanding, skills and (if relevant) attitude, for the profession you are educated for. These are also entry qualifications for the professional practice. The exit qualifications for your degree programme are outlined below.

Exit qualification	Description
Professional conduct and guiding professional development	1.1. Shows a professional, pro-active, curious, scientific and entrepreneurial attitude: adapts quickly, motivates him/herself, shows initiative, is goal-oriented, and acts honestly and efficiently 1.2. Works efficiently in a team (colleagues, project leader, client) during all phases of the project through open communication and by considering the needs of others. 1.3. Pro-activity contributes to setting up and maintaining a professional network. 1.4. Critically reflects on the project with respect to scientific project management approach and results. 1.5. Critically reflect on the own role in the course of a project. 1.6. Critically reflects on the own personality and how this influences professional conduct. 1.7. Defines personal learning goals (based on project/work requirements) and guides personal development to reach learning goals.
Designing strategies for applied research and product development	2.1. Is able to independently acquire knowledge in a new subject by consulting specific literature and other resources; is able to identify reliable and suitable sources; Discriminates between major and side issues 2.2. Combines information from different sources in the context of the own project 2.3. Defines the project aim in terms of products and/or results based on the acquired background information 2.4. Defines the quality requirements for products and processes based on legal requirements. 2.5. Designs different approaches that could lead to the project aim. Evaluates these possibilities and justifies the choice based on scientific arguments and practical parameters such as time, costs, quality and personnel 2.6. Designs a complete strategy leading to the project aim (project of about 3-4 months; see also: managing projects) 2.7. Identifies opportunities to patent products, results and strategies.
Design, analysis and control of experiments	3.1. Designs experiments based on the required quality and quantity of the product or result. 3.2. Applies strict logical thinking to draw conclusions from the results and interprets them: - in the context of the experiments - in the context of the project aim (helicopter view) - in comparison to other analyses, reference/theoretical values, and quality requirements. 3.3. Solves practical problems if experiments do not work as planned (trouble shooting); couples back to the theory or consults colleagues if necessary; suggests alternative experiments.
Communication	4.1. Reports project plans and results according to the standard format of scientific documents and meets the scientific international conventions criteria 4.2. Presents project plans and results in English to colleagues, other researchers in the field or to clients. The presentation is at a level equivalent to a presentation at an international symposium 4.3. Describes the key message of the project relevant for patenting, registration, and/or business development. Uses terminology that is understandable for experts from different departments 4.4. Organises and moderates meetings 4.5. Contributes to the efficiency of meetings by being prepared and actively participating 4.6. Keeps client and project members informed about project progress at all stages, especially when the project is not progressing as planned 4.7. Shows initiative to adapt communication styles to the others and the situation at hand.

Exit qualification	Description
Managing projects	Takes responsibility for a project by: 5.1. Defines project deliverables based on the needed quality and quantity 5.2. Identifies project risks based on the (experimental) approach and on (putative) competitors 5.3. Defines project exclusions 5.4. Organizes the project in phases and defines decision points/ milestones 5.5. Describes the project organisation including the responsibilities of all project members 5.6. Writes a communication plan concerning all project members and parties involved 5.7. Describes a schedule based on the (experimental) plan 5.8. Describes the required budget 5.9. Performs his/her responsibilities 5.10. Approaches others if they do not perform to their responsibilities 5.11. Sets priorities and works efficiently towards the defined project aim/deliverables 5.12. Is in control of the project during all phases by being pro-active if the project does not run according to the plans and initiating an alternative strategy 5.13. Is flexible with changing circumstances by adapting the experimental, project and/or communication strategy 5.14. Obtains the deliverables in time and with the described resources; if not, reasons and justifies the decisions that have been taken in the course of the project.
Advising	6.1. Actively involves different specialist to collect advise contributing to the progress of the project. 6.2. Actively participates in a discussion about related projects by asking critical questions and suggesting follow-up experiments. 6.3. Advises about follow-up projects of the own project. 6.4. Integrates own project results in the multidisciplinary defined goals and advises other departments 6.5. Gives advice about choosing new equipment or methods based on project goals, overall goals and available resources.

We have geared the level of the exit qualifications to the European Qualifications Framework (EQF) level 7. These are internationally accepted criteria for Bachelors and Masters levels. As a result, our degree programmes are guaranteed to be at the correct national and international level. The degree certificates meet all legal requirements and are therefore comparable with and equal to similar degree certificates from other educational institutions in the Netherlands and abroad.

Relation between the EQF descriptors and the competences matrix

	Professional conduct and guiding professional development	*Designing strategies for applied research and product development*	*Design, analysis and control of experiments*	*Communication*	*Managing projects*	*Advising*
- have demonstrated knowledge and understanding that is founded upon and extends and/or enhances that typically associated with Bachelor's level, and that provides a basis or opportunity for originality in developing and/or applying ideas, often within a research context;		x	x			x
- can apply their knowledge and understanding, and problem solving abilities in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study;		x	x		x	x

- have the ability to integrate knowledge and handle complexity, and formulate judgements with incomplete or limited information, but that include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgements;	x	x	x		x	x
- can communicate their conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences clearly and unambiguously;				x		x
- have the learning skills to allow them to continue to study in a manner that may be largely self-directed or autonomous.	x					

Relation between the competences and examinations (modules in bold):

	Professional conduct and guiding professional development	Designing strategies for applied research and product development	Design, analysis and control of experiments	Communication	Managing projects	Advising
Fundamentals						
Exam			x			
Drug Discovery and Development						
High-throughput analysis		x	x	x		
Drug Discovery poster presentation		x	x	x		x
Fundamentals of Pharmaceutical Chemistry		x	x	x		
Structure Elucidation Analysis			x			
Production of Biomolecules, part 1						
Strategy for microbial oil production (presentation)		x	x	x		x
Production of Biomolecules, part 2						
Theoretical exam			x			x
Planning and quotation for small scale protein production		x	x	x	x	
Vaccines and Diagnostics						
Vaccine proposal		x	x	x	x	x
Validation plan for analytical validation of diagnostic test		x	x	x	x	x
Research and Product Development, part 1						

Scientific document		x	x	x		
R&D presentation				x		
Research performance 1		x	x		x	x
Design of Experiments		x	x	x		
Scientific Progress report			x	x		
Research and Product Development, part 2						
Research performance 2						
Assignment on Quality regulations		x		x		
Business plan		x		x	x	x
Project management, part 1						
Professional conduct including network analysis	x			x	x	
Project proposal		x	x	x	x	
Project management, part 2						
Professional effectiveness	x			x	x	
Reflection on realization of proposal and own contribution	x				x	
Graduation project	x	x	x	x	x	x

HAN_UNIVERSITY OF APPLIED SCIENCES

5 Structure of a Masters programme at a university of applied sciences

This chapter gives a broad description of your degree programme. The Education and Examination Regulations and other regulations give you the rules and details.

5.1 Scope

The scope of the degree programme is represented in ECTS credits and study load. One credit is equal to 28 hours of study (this is an average indication). This is also regulated in the Act.

Your Masters degree programme has a study load of 120 credits.

Both the full and part-time programmes are 120 ECTS credits. Based on minimally one year of work experience, students can get exemption for parts of the modules Research and Product Development Skills part 1 and Project Management part 1. To this end, they need to hand over a portfolio containing a scientific document, R&D presentation, a network analysis and proofs for their level of Research Performance and Professional conduct. With these products/assessments, they can prove to have acquired the intermediate level defined in these modules. Upon successful proof, students are exempted from the teaching activities and products covering this intermediate level (see the description of the units of study Research and Product Development Skills 1 and Project Management 1 in chapter 6 of part 2 of this Degree statute).

5.2 Degree programme overview

Below is a schematic overview that gives you an overall impression of the programme. It also indicates the units of study [and modules] contained in the degree programme. The detailed regulations of the content of the degree programme and study programme can be found in the Education and Examination Regulations (EER).

Structure of the study programme (full-time, part-time):

The degree programme contains the following units of study with the stated study load for each degree format as referred to in article 3.1 paragraph 1:

Full-time	**Part-time**
Fundamentals (8 credits)	Fundamentals (8 credits)
Project Management 1 (15 credits)	Project Management 1 (15 credits)
Research and Product Development Skills 1 (23 credits)	Research and Product Development Skills 1 (23 credits)
Drug Discovery and Development (9 credits)	Drug Discovery and Development (9 credits)
Production of Biomolecules 1 (5 credits)	Production of Biomolecules 1 (5 credits)
Production of Biomolecules 2 (4 credits)	Production of Biomolecules 2 (4 credits)
Project Management 2 (7 credits)	Project Management 2 (7 credits)
Research and Product Development Skills 2 (10 credits)	Research and Product Development Skills 2 (10 credits)
Vaccines and Diagnostics (9 credits)	Vaccines and Diagnostics (9 credits)
Graduation Project (30 credits)	Graduation Project (30 credits)

HAN_UNIVERSITY OF APPLIED SCIENCES

Curriculum structure and contents

The study programme is divided into ten units of study identical for the full-time and part-time degree programme. The units of study and how they are organized during the degree programme is depicted in figure 4.

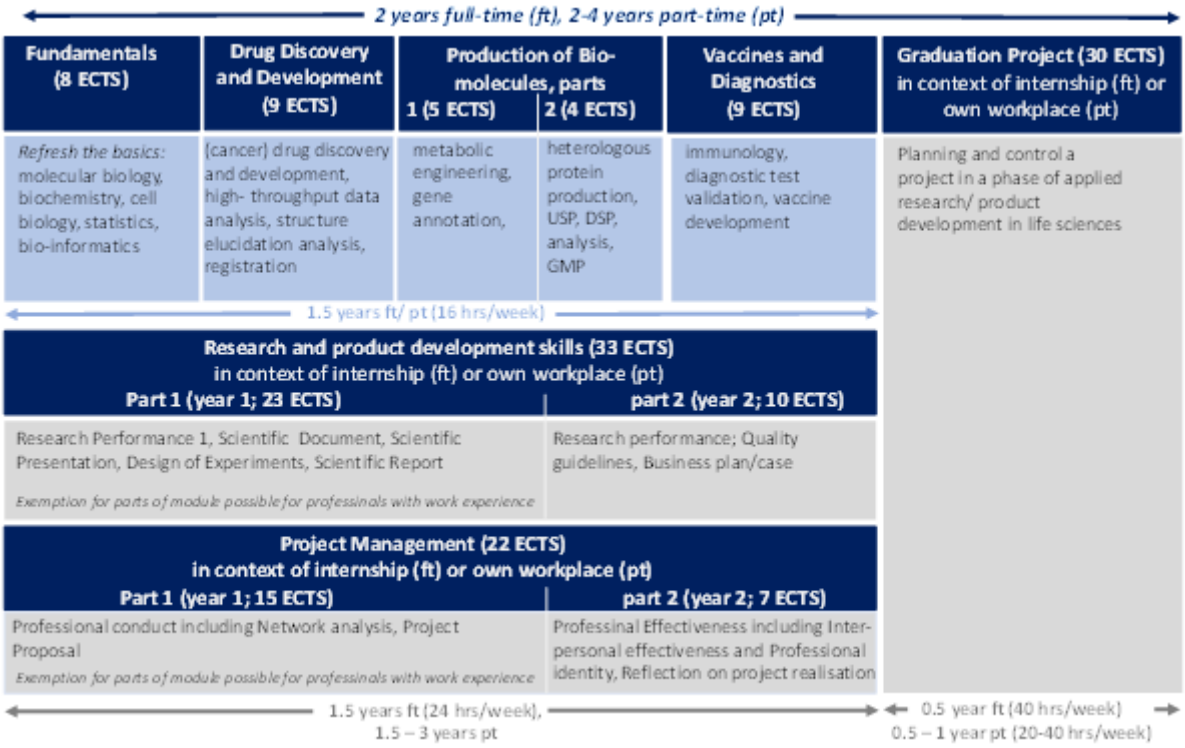

Figure 4: *Schematic structure of the full-time (ft) and part-time (pt) programme . Differences of the part-time to the full-time programme are within the modules Research and Product Development Skills, part 1 and 2, Project Management, part 1 and 2, and the duration of the Graduation Project. These modules are mainly carried out in the context of the own (internship) workplace. Part-time students can set individual deadlines for products of the modules Research and Product Development Skills, part 1 and 2, and Project Management, part 1 and 2, within 3 years after study start, and can get exemption for parts of the modules Research and Product Development Skills, part 1, and Project Management, part 2, based on their work experience.*

Year 1	Year 2
Fundamentals	Production of Biomolecules 2
Drug discovery and Development	Vaccines and Diagnostics
Production of Biomolecules 1	Research and Product Development 2
Research and Product Development 1	Project Management 2
Project Management 1	Graduation Project

HAN_UNIVERSITY OF APPLIED SCIENCES

6 Academic calendar

This chapter outlines the lecture days, lecture times and the holidays and lecture-free weeks.

6.1 Lecture days and lecture times

Regular tuition day of the programme is Monday. Not every Monday is scheduled as contact day. In addition, a complete week of lectures and course activities are scheduled in October of the first year.

The dates of the course-specific holidays, contact days and deadlines for assignments are provided as a preliminary schedule at the beginning of the course.

The definitive dates, including lecture times and exact deadlines for assignments are provided at least two weeks prior to each module in the detailed module schedule.

In addition to the contact days at HAN, full-time students spend 3 (first 1.5 years of the study programme) to 5 (final 0.5 year of programme) days a week at their internship
placement to complete their workplace learning modules. The exact days and times are set in agreement with the placement supervisor.

6.2 Holidays and lecture-free weeks

The academic calendar for this academic year can be found on HAN Insite:

www.han.nl/insite/jaarplanning

It indicates the lecture weeks and holidays.

7 HAN organisation

This chapter provides information about the organisation of HAN University of Applied Sciences. Here you also find information on participation, quality assurance and the facilities you as a student can use.

7.1 Faculties and institutes

The degree programmes at HAN University of Applied Sciences are spread over four faculties: Business Management and Law (FEM), Education (FED), Health and Social Studies and Engineering. In addition, HAN has two 'interfaculty institutes': the Centre for Valorisation and Entrepreneurship and HAN Master Programmes (HMP). Each faculty consists of a number of institutes. The different degree programmes belong to these institutes. Your degree programme belongs to the the Interfaculty Institute of HAN Master Programmes (HMP) and the [enter institute OR the Interfaculty Institute of HAN Master Programmes (HMP)].

You can find more about the faculties and institutes on our website: www.han.nl/start/corporate/over-de-han/faculteiten-en-instituten. /enter where this information about HMP can be found.

All supporting services at HAN are incorporated in the Services Department.

7.2 Management and organisation at faculty and institute levels

HAN Insite provides information about the set-up, organisation and staff of your degree programme and institute, and about the faculty they belong to: www.han.nl/insite.

There you can also find out who is on the faculty board, who is part of the institute management, who is on the degree committee and who is part of the institute council.

7.2.1 Board of examiners and examiners

The members of the board of examiners can be found on HAN Insite:
https://www1.han.nl/insite/hmp/Examencommissie.xml?inno_gen=gen_id_208&sitedir=/insite/hmp

You can contact the board of examiners of your degree programme by sending an email to Examencommissie.masters-gezondheidszorg@han.nl

The members of the board of examiners are appointed by the HMP Programme Council.

The tasks and responsibilities of our board of examiners can be found in the Regulations of the Board of Examiners. These include additional rules regarding assessment and examination in so far as these are within the powers of the board of examiners. Part 3 of the DS.

The board of examiners decides, amongst other things, whether you meet the conditions to graduate, as set out in the EER. You must have the required knowledge, understanding and skills. If you do, you receive your degree certificate.

The board of examiners appoints examiners for each exam. One or more appointed examiners set that exam and determine the results.

Other duties and powers of the board of examiners include:

- Assuring exam quality
- Granting exemptions
- Handling requests for extra exam opportunities
- Handling requests for modified exam formats
- Granting an increase of study load
- Handling complaints.

Your department has appointed (an) external supervisor(s). An external supervisor evaluates whether the quality of the final assessment of the Masters degree is sufficient. The external supervisor is not an examiner.

You can find all the further rules on exams and final assessments that apply to you in the EER. For rules on the organisation of exams and final assessments, please refer to the Regulations of the Exams Office.

7.2.2 Participation and consultation

Below is a short overview of the committees and councils of HAN University of Applied Sciences. They discuss and also influence the policies and decisions made at HAN.

Degree committee

Each degree programme or group of programmes has a degree committee. A degree committee consists of the same number of lecturers as students. The degree committee advises the department about promoting and guaranteeing the quality of the degree programme. Each year it also evaluates the degree programme's compliance with the EER. The degree committee also has the right to be consulted on various matters. Through this committee, you can contribute ideas and make decisions about the curriculum and organisation of your degree programme. Would you like to join the degree committee? Ask your Master coordinator for more information. The degree committee has its own regulations (see Part 5).

Institute council

The Interfaculty Institute of HAN Master Programmes has an institute council. This council has the right to discuss all institute matters and to pose questions to the institute management. The institute council has the right to be consulted on various institute matters, including policy and budget. An institute council consists of six members: three staff and three student members. In the institute council you can participate and have a say about the policy of HAN Master Programme as a whole. Want to join the institute council? Ask your institute council (instituutsraad.hmp@han.nl) for more information about the institute council. Want to know more about the institute council? Are you curious about who is on this council? Go to HAN Insite:www.han.nl/insite. Click on HAN Master Programmes in the left column, and then on the 'About us' tab.

Participation Council

The Participation Council allows staff and students to participate at HAN level. The council has a right of consent on certain aspects of policy, on the main features of the institution budget, the general applicable part of the Education and Examination Regulations and more. The Participation Council consists of 16 members: eight staff and eight students. The Participation Council deals with general HAN policy. Would you like to join the Participation Council? Ask your participation council (mr@han.nl) for more information. Would you like to learn more about the Participation Council? Are you curious about who is on this council? Go to HAN Insite: www.han.nl/insite and click on 'Participation' in the left column.

7.3 Student facilities

7.3.1 Support

As a student, you can rely on good support during your academic career. Your department offers support and advice to help you progress through your studies. In addition, you can get support from HAN Study Success. This is a team of experts who work together on one goal: your growth as a student.

Experts you can call on

As a student, you can contact HAN Study Success for support, advice, training and coaching. This is a network of experts in various areas of student supervision. They have expertise in:

- Study skills, language skills and personal development
- Course transfers and delays
- Psychological support
- Student grants, support funds and questions about finances
- Studying with a functional disability or chronic illness
- Course selection and further studies
- Various statutory and university of applied sciences regulations
- Complaints, objections and appeals procedures
- Studying as an elite athlete
- Purpose and spirituality

Visit https://www1.han.nl/insite/studiesucces/home_opl.xml? for more information and contact details.

Confidential counsellors

At HAN we treat each other respectfully. Unfortunately, incidents can occur in which you have to deal with unacceptable and/or disruptive behaviour. If this happens, you can contact one of the confidential counsellors. You can find more information and the contact details for the confidential counsellors at HAN Insite: https://www1.han.nl/insite/pz_new/content/Vertrouwens_personen.xml?inno_gen=gen_id_280&sitedir=/insite/studiesucces

Complaints and Disputes Office

Do you have a complaint, dispute, objection or appeal? The first step is to try to work it out together, possibly with the support of the Student career coach. If this does not help, you can contact the Complaints and Disputes Office. The Complaints and Disputes Office ensures that complaints and letters of appeal are delivered to the right persons within the HAN organisation. The office also takes care of the secretarial duties of the Examination Appeals Board.
E: Bureau.klachtengeschil@han.nl
T: 026-3691504
A: Verlengde Groenestraat 75 Nijmegen / Postbus 6960, 6503 CD NIJMEGEN
I: www.han.nl/insite/bureaukeng

Ombudsman

Do you have a complaint that does not fall under the existing complaints and appeals procedures? Then you can turn to an independent ombudsman. The ombudsman has a mediatory role.
E: ombudsman@han.nl

7.3.2 Information facilities

Student Affairs Enquiry Desk

Do you have questions about your degree programme? For example, about enrolment, payment of tuition fees, examinations, lecture timetables or the study information system (Alluris)? You can ask the staff at the Student Affairs Enquiry Desk. Find out more about this on HAN Insite: https://www.han.nl/insite/rondomdestudie/Vraagpunten.xml?a=b&sitedir=self&profiel_select=InsiteSb

Study and Multimedia Centres

Here you can search for paper and digital sources, or find a quiet place to work. You also have access to DVDs, CDs, CD-ROMs, digital information sources and online videos. For more information about opening hours, telephone numbers etc., visit the website of the study and multimedia centres:www.han.nl/studiecentra.

HAN Information Centre
The staff at the HAN Information Centre can tell you everything about Masters programmes, forms of collaboration, promotional activities and the organisation of the entire institution.
Opening hours: Monday to Friday 9.00 - 16.30 (until 15.00 during holidays)
T: (024) 353 05 00
E: info@han.nl
I: www.han.nl/start/bachelor-opleidingen/studie-kiezen/zoek-je-opleiding/aan-het-woord/

International Office
HAN is also active internationally. The activities are extremely varied. For example, International Office works on internationalisation of the curriculum, expanding the international network of partner universities, studying abroad for HAN students and lecturer exchanges. International Office also coordinates HAN's efforts in three important internship projects for community work in South Africa, India and Curacao. Finally, International Office offers practical support regarding scholarships (including Erasmus+) and filling in forms such as the Learning Agreement. The International Office is also the first point of contact for international students. The International Office is located in Arnhem (Ruitenberglaan 31) and Nijmegen (Kapittelweg 33). Drop by to ask your questions or visit the Insite page of the International Office.
I: https://www1.han.nl/insite/internationaloffice_english/home_opl.xml

7.3.3 Other facilities and services

Sports facilities
As a student of HAN University of Applied Sciences you can purchase a sports card. This allows you to use the sports facilities of HAN Seneca (the centre for sport and health at HAN), the sports facilities of the Arnhem council and the sports facilities of Radboud University Nijmegen. For more information, visit:www.han.nl/start/bachelor-opleidingen/studeren-bij-de-han/sporten-bij-de-han.

HAN Employment
HAN Employment is the employment service counter of HAN University of Applied Sciences that mediates between graduates, students and employers. Students and alumni can find vacancies for permanent positions, part-time jobs and work experience positions. At HAN Employment you can also follow training courses on job applications, networking and orientation to the labour market. For more information and contact details, see: www.han.nl/start/corporate/alumni/carriereservices/hanemployment/.

HAN Centre for Valorisation and Entrepreneurship
At the HAN Centre for Valorisation and Entrepreneurship you can find more information, knowledge and experience in entrepreneurial education, about valorisation networks and about support for staff applying for subsidies. The centre also contributes to activities, projects and funding for valorisation (circulation of knowledge), innovation and entrepreneurship.
T: (026) 365 82 66
E: CvVO@han.nl
I: http://specials.han.nl/themasites/cvvo

Health and safety for students
Would you like to know more about the rules for safe and healthy work practices at HAN University of Applied Sciences? Or do you want to know which resources we have in this area? Visit the special health and safety pages for students on Insite: www.han.nl/insite/arbovoorstudenten

HAN Language Centre
HAN Language Centre can help you with all your language and translation needs. You can also sign up for various language courses, language coaching or language workshops. HAN students receive a discount on all foreign

language courses.

At HAN Language Centre you can also take a writing or spelling course. There is also a special course (in Dutch) for students with dyslexia. The courses are intended for both Dutch and international students.
T: (024) 353 03 04
E: talencentrum@han.nl
I: https://www.han.nl/werken-en-leren/vakgebieden/talen/

HAN_UNIVERSITY OF APPLIED SCIENCES

Education and Examination Regulations (part 2) of the Master programme Molecular Life Sciences

Instituut HAN Masterprogramma's
Academic year 2019-2020

Date of last adoption by the HMP Programme Council	04-07-2019
Date of last adoption by the institute council	26-06-2019
Date of last adoption by degree committee	10-05-2019

HAN_UNIVERSITY OF APPLIED SCIENCES

Table of contents

HAN_UNIVERSITY OF APPLIED SCIENCES

1 About the Education and Examination Regulations (EER)

Each set of Education and Examination Regulations (EER) is included in a degree statute. The EER describes the study programme for the degree programme for each academic year. The EER covers the education, exams and final assessments for your degree programme and your rights and obligations. The introduction in each chapter – the unnumbered section – only contains information. No rights or obligations can be derived from this.

1.1 Terms and definitions

The terms and definitions used in these Education and Examination Regulations are given below:

Graduation specialisation	A specialisation within a degree programme as defined in the EER.
Assessment criteria	Clearly defined and unambiguous standards that can be used to give a motivated assessment of whether and to what extent a student meets the required level of knowledge, insight and skills and (if relevant) attitude assessed in an exam or modular exam.
Assessment dimensions	Assessment dimensions give a global description of the aspects on which a student's performance and/or the resulting products should be assessed. These descriptions need to be global because the assessment dimensions should apply to any type of student performance that demonstrates their qualification.
Professional task	A meaningful, complete task as carried out in all its complexity by a professional practitioner in an actual professional setting with all its complexities.
Professional requirements Entry qualifications	Well-defined qualifications regarding the knowledge, understanding and skills and (if relevant) the attitude a student needs to carry out the profession they are studying for.
BRIN number	The Basisregistratie Instellingen (BRIN) is a database for educational institutions that is published by the Dutch Ministry of Education, Culture and Science. It contains all schools and related institutions. Each educational institution is identified in the database with a number. The BRIN number for HAN is 25KB.
Examination Appeals Board	This is the board referred to in article 7.60 of the Act (Higher Education and Research Act). The board deals with appeals submitted by students against decisions made by HAN. The Regulations for the Examination Appeals Board are included in the HAN Student Charter.

D track	This is a customised study programme that has the same exit qualifications, assessment dimensions and assessment criteria for units of study as the regular programme (A track). It allows a student to follow their own study track in continuous consultation with examiners, lecturers and classmates.
Work-study	A degree programme in which competences are developed through on-campus and off-campus work/learning activities. A work-study degree programme alternates on-campus learning with related practice in the professional field.
Exit qualifications Exit qualifications	Well-defined outcomes regarding the knowledge, understanding and skills and (if relevant) the attitude a student should acquire by the time they complete their degree programme.
External student	A person enrolled at a university or university of applied sciences who can participate in exams and final assessments but not in the education or supervision.
Head examiner	Appointed by the board of examiners as the head examiner responsible for the results of an exam and assessment in cases where more than one examiner has been appointed for an exam.
Institute	An organisational unit within a faculty that comprises one or more degree programmes.
Exams taken independently of the standard programme	An exam or modular exam for which a student did not follow the corresponding study programme. Instead, the student is assessed on whether they possess the related competences, regardless of where the knowledge, understanding, skills and (if relevant) attitude required for the exam or modular exam were acquired.
Module	An internally coherent and to some extent independent part of a work-study degree programme. A module consists of one or more units of study and is aimed at a realistic cluster of qualifications derived from professional practice.
EER	Education and Examination Regulations.
Unit of study	A basic unit of HAN education that is aimed at achieving clearly defined objectives in terms of knowledge, understanding, skills and (if relevant) attitude. These are assessed in an exam and awarded a certain number of ECTS credits.
Degree committee	The legal consultative body responsible for the tasks specified in the Regulations of the Degree Committee concerning consent, advice and evaluation for the degree programmes mentioned in section 1.2.

Student	A person enrolled as a student in a degree programme at HAN University of Applied Sciences with the aim of participating in education and exams.
Study load in hours (SLH)	SLH is used to express the size (number of study hours) for each unit of study.
Academic year	The period starting on 1 September and ending on 31 August of the following year.
ECTS credit	One credit is equal to 28 hours of study (this is an average indication).
[Personal tutor]	A staff member responsible for the personal tutoring of one or more students.
Exam	A test of the student's knowledge, understanding, skills and (if relevant) attitude in conjunction with each other. Also, the assessment of the results of that test. The exam is the concluding component of a unit of study.
Exemption	A decision made by the board of examiners that a student does not have to take exam(s) relating to one or more specific units of study. This decision is based on the board's opinion that the student has already sufficiently mastered the required knowledge, understanding, competences and/or skills and (if relevant) attitude.
Act	Higher Education and Research Act (in Dutch: *Wet op het Hoger onderwijs en Wetenschappelijk Onderzoek*).

Other terms and definitions have the meanings given to them in the national laws and regulations.

1.2 Where do these Education and Examination Regulations apply?

These are the Education and Examination Regulations as referred to in article 7.13 of the Act, for the following Masters degree programme Molecular Life Sciences at HAN University of Applied Sciences (BRIN□ number 25KB):

Name	Academy	CROHO	Title after the programme
M Molecular Life Sciences	Instituut HAN Masterprogramma's	49293	Master of Science

Degree and title after graduation see: https://www.nvao.net/actueel/publicaties/nvao-hbo-titulatuur-overzicht

1.3 Which Education and Examination Regulations apply to you?

The EER are revised each year at HAN University of Applied Sciences. This does not mean everything changes each year. Generally only a small number of changes are made to the study programme and organisation.

This EER applies to the 2019-2020 academic year, so starting on 1 September 2019 and ending on 31 August 2020.

Changes made to the EER do not apply to events or matters in the past, but only to the new academic year. Special

rules may apply when switching from an "earlier" EER to a new EER. These rules can be found in the transitional regulations in chapter 8.

Only in exceptional cases are changes needed to the EER during an academic year. Changes can only be made during an academic year if this is reasonably necessary and does not disadvantage the students. Transitional regulations may also apply in these cases: see chapter 8.

In cases not provided for in these Education and Examination Regulations, the HMP Programme Council will decide. If a case is subject to the authority of the board of examiners, a decision will be made by the chair of that board of examiners. Those with an interest in the decision will be informed of that decision within four weeks.

HAN_UNIVERSITY OF APPLIED SCIENCES

2 Accessibility of the degree programme

The general HAN rules for applications, admissions, education requirements, selection and enrolment can be found in the enrolment regulations https://www.han.nl/international/english/admissions/admission-criteria/.This chapter contains rules that apply more specifically to accessibility of the degrees mentioned in section 1.2.

2.1 Language in which degree is offered

This degree programme is offered in English. If you want to successfully complete a degree programme offered in English, you need to have sufficient mastery of the language.

2.2 Maximum number of admissions

If the number of registrations for the degree programme exceeds the maximum set number of people who can enrol for the degree programme, the following will apply for admission: full-time programme are enrolled if they acquired a placement. Applicants are selected for a placement by the placement-providing organisations based on their motivation, experience and acquired knowledge, understanding and skills.

2.3 Quality admission requirements

In addition to the general admission requirement of a Bachelors degree in the field of molecular life sciences (molecular biology, cell biology, biochemistry) or having the equivalent knowledge, understanding and skills according to the enrolment regulations, the following quality admission requirements also apply for this degree programme: Professional use of English (B2 level of English according to the Common European Framework of Reference recommended) and motivation to work in the field of applied research and product development in life sciences/biotech.

2.4 If you as a student do not yet meet all the requirements

2.4.1 You do not meet the language requirement for enrolment in a specific unit of study

If the applicant is unable to submit a degree certificate or other documents demonstrating that he or she meets the language requirements as referred to in paragraphs 2.3 of this article, he or she may take an admission test to demonstrate that he or she meets the language requirements.

2.4.2 There are gaps (deficiencies) in your prior education, but you are already enrolled

If the applicant is unable to submit a degree certificate or other documents demonstrating that he or she meets the entry requirements as referred to in paragraphs 2.3 of this article, he or she may take an admission test to demonstrate that he or she meets the entry requirements

2.4.3 When can you take an admission test?

If you cannot submit a degree certificate or other documentation that shows you meet the entry requirements, you may take an admission test to demonstrate that you meet the entry requirements. This admission test is organised and administered by the board of examiners for the degree programme.

2.4.3.1 You have a refugee status and do not meet the education requirements

Did you flee your home country? Are you unable to prove that you meet the education requirements? Then you can

take an admission test to demonstrate your suitability for admission to a university of applied sciences. The procedure for this is described in section 2.4.3.

In addition, the same language requirements apply as for other foreign students: ‘Staatsexamen Nt2, Programma II’ or sufficient English proficiency if relevant. Section 2.1 applies. You need to pass all components before you can be enrolled in the degree. The further education requirements and additional requirements described in the enrolment regulations also apply to you.

2.5 Abridged programme

Not applicable

2.6 Network requirements for part-time degree programme(s)

If you do the part-time programme for this degree, you need to meet certain network requirements. These requirements also apply if you are self-employed. Student must be working in a position and at a company relevant to the degree programme. He or she must have either an employment contract, work placement contract, or a VAR (declaration of independent contractor status) issued by the Dutch tax office with the further specification ‘WUO’ or ‘Winst Uit Onderneming’ (profits from business activities) relating to this work. *Instead of a VAR-WUO, a student may also submit a contract assessed by the Dutch tax office showing that the student's work activities cannot be regarded as employment.*

The workplace must offer the opportunities to release the units of study of Research and Product Development Skills, Managing Project Skills, and Major Project. These requirements are further specified in the unit of study descriptions in chapter 6.

2.7 Employment/learning contract for the work-study degree format

Not applicable

2.8 Extra contribution

Not applicable

HAN_UNIVERSITY OF APPLIED SCIENCES

3 Description of the degree programme

In this chapter you can read about the format in which the degree programme is offered, where it is taught, how it is organised and what each component involves. You can also read about the study load of the different units of studies offered in the degree programme.

3.1 Degree formats and variants

You can take your degree programme in the following formats:
Full-time
Part-time

At location: Laan van Scheut 2, 6525 EM, Nijmegen.

3.2 Structure of degree programme

The degree programme is composed of the following units of study.

- Fundamentals (8 credits)
- Project Management 1 (15 credits)
- Research and Product Development Skills 1 (23 credits)
- Drug Discovery and Development (9 credits)
- Production of Biomolecules 1 (5 credits)
- Production of Biomolecules 2 (4 credits)
- Project Management 2 (7 credits)
- Research and Product Development Skills 2 (10 credits)
- Vaccines and Diagnostics (9 credits)
- Graduation Project (30 credits)

The study load of a unit of study is at least 1 ECTS credit.
The structure of the study programme for the degree programme is provided in chapter 6.

3.2.1 Study load and ECTS credits

The degree programme consists of a coherent set of units of study. The study load of a degree programme and of individual units of study are expressed in ECTS credits. The Masters programme has a study load of 120 ECTS credits. Each academic year is structured in a way that it has a standard study load of 60 ECTS credits.

3.2.1.1 Study load for abridged programme

Not applicable

3.2.1.2 Study load for work-study format

Not applicable

3.2.2 Elective units of study

Not applicable

3.2.3 Graduation specialisation

Not applicable

3.2.4 D track education and exams

Not applicable

3.3 If the content or structure of your degree programme changes

We regularly change or update components of the study programme so we can guarantee the quality of the degree and the value of your degree certificate. This means the EER for a next academic year may contain changes to your study programme.

Changes to the study programme can have certain consequences. If you fall behind in your studies, for example, you may need to pass a different exam than you initially thought. A change may also mean an exam is still offered, but you can no longer attend the classes for this particular component.

A change cannot mean that units of study or exams/modular exams you have already passed no longer count towards your final Masters assessment. The law only allows this is highly exceptional cases.

If required, the transitional regulations in chapter 8 stipulate how this works for each change made to the study programme.

3.4 Extra units of study

Not applicable

4 Personal tutoring, study facilities and study feasibility

The learning objective and basic principle is that you are responsible for your own learning process. We also want you to feel acknowledged, seen and heard during your entire time as a student. You are entitled to good personal tutoring. Each department offers support for this. If needed, HAN can also offer you academic, psychological and financial support. The HAN Study Success network offers support for successful study progress.

4.1 What does your department provide to help you study?

The institute offers facilities that enable you to do well in your studies.
In addition to the general facilities, your department also offers at least the following facilities:

1. personal tutoring as described in these Education and Examination Regulations;
2. two exam opportunities each academic year;
3. facilities for students with a functional disability;
4. facilities for students who are pregnant, young parents, and informal care givers;
5. special support for international students;
6. special support for students from minority groups;

4.2 How is personal tutoring organised?

The personal tutoring starts with the introduction or re-introduction to the Student career coach at the start of the academic year. In the first year of study, your Student career coach invites you to at least 3 meetings. Furthermore, personal tutoring is mainly integrated in the study programme as part of the units of study.

HAN also has the Study Success network, which offers support to help students succeed in their studies. Students who need this can get extra support.

Departments each have their own structure and set-up for personal tutoring:
IN ANY CASE points 3 to 6 of article 4.1:

General information about personal tutoring

The aim of study tutoring is to support and guide students personally to optimal study success.

Though students work rather independently during their master education, personal attention is an important aspect of the master programme in Molecular Life Sciences. The study is seen as an integral part of the professional and private life of students and adjusted as much as possible to the needs of individuals.

For mastering the competences developed with the modules Research and Development Skills and Project Management, the context of workplace plays a pivotal role.

Specific elements of personal tutoring

Study tutoring in the Molecular Life Sciences master course is based on the master level professionals are educated to. Each student has s student career coach. Personal discussions of the student, student career coach and workplace supervisor will be scheduled on a regular basis. During these discussions, the competence development, study progress, learning goals and individual needs of students will be discussed. Furthermore, combining study with professional and private life can be subject of these discussions.

Next to the structural discussion, students can always contact their student career coach, lecturers, the programme coordinator or the administrative support (secretary) with specific questions or problems. There is an ‘Open door policy’.

Personal requirements of students are met as much as possible and sensible with respect to the regulations, practical feasibility and the student's study progress.

5 Exams and final assessment

This chapter covers exams, modular exams and the final assessment for your degree programme.

5.1 Coherent set of units of study

A degree programme consists of a coherent set of units of study that are defined and described in chapter 6. Each unit of study has a related exam**.** An exam can consist of two or more modular exams that have a predetermined weight factor and jointly determine the grade for the exam of the unit of study.

5.2 Exam

The result of an exam for a unit of study is used to determine whether the student has the knowledge, understanding and/or skills and (if relevant) attitude required to successfully complete that unit of study. The assessment dimensions and assessment criteria of the exams and modular exams are provided in chapter 6.

5.2.1 Entry requirements

Some units of study have entry requirements for participating in educational activities, exams and modular exams for that unit of study. The entry requirements are provided in the unit of study descriptions in chapter 6. Entry requirements may be:
- You need to pass one or more specific other exam or modular exam
- You need to sufficiently master the language in which the unit of study is given.
- Successful completion of a unit of study.

5.2.2 Mandatory participation

In some cases you may only do an exam or modular exam if you have participated in the educational activities for the unit of study linked to that exam or modular exam.
This is the case when the educational activity is required for/part of the assessment.

Chapter 6 further stipulates which units of study have full or partial mandatory participation.
The appointed examiner may grant full or partial exemption of mandatory participation. In that case, the examiner imposes an equivalent requirement instead.

5.2.3 Exam format

The format of an exam or modular exam is specified in chapter 6 in the description of the unit of study concerned. The board of examiners may deviate from this format in special cases, on request or at their own initiative.

5.3 The examiner

Each exam and modular exam is designed and assessed by one or more examiners, as decided and appointed by the board of examiners. The examiner determines the result of the exam or modular exam and sets the grade. If more than one examiner is appointed, the head examiner sets the definite grade.

5.3.1 When do you pass an exam?

The examiner gives the result of an exam as a grade.
The result of an exam is expressed in one of the following numbers: 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10.
You pass the exam if you earn a grade of 6 or higher.

You *fail* the exam if you earn a grade of 5 or lower.

5.3.2 How is the overall grade calculated for an exam with modular exams?

A grade for a modular exam is rounded to a number with 1 decimal place.
Grades with the decimals 1, 2, 3 or 4 are rounded down.
Grades with the decimals 5, 6, 7, 8 or 9 are rounded up.
You pass a modular exam if you earn a grade of 5.5 or higher.
You fail a modular exam if you earn a grade of 5.4 or lower.

When the overall grade for the exam is calculated, the grades earned for the modular exams are weighted as specified in the unit of study descriptions given in chapter 9. The final exam grade is then rounded as following.
Exam grades with the decimal 1, 2, 3 or 4 are rounded down to whole numbers.
Exam grades with the decimal 5, 6, 7, 8 or 9 are rounded up to whole numbers.

5.3.3 Final grade and compensation

The final grade for an exam or modular exam is the highest grade achieved. You are allowed to resit an exam or modular exam even if you pass it.

5.3.4 When are you awarded a 'pass/fail' qualification?

Contrary to sections 5.3.1 and 5.3.2, a pass/fail can be given instead of a grade in the following cases:
a) you have an exemption for one or more modular exams, so the result of that exam cannot be expressed in a grade,
b) the HAN conversion tables do not apply,
c) if an exam consists of modular exams, the result of a modular exam can be expressed in a grade or in a 'pass' or 'fail'. The unit of study descriptions in chapter 6 specify which modular exams are assessed with a grade and which with a 'pass' or 'fail'.

5.4 Number of exams per academic year

You have two opportunities each academic year to take an exam or modular exam. The descriptions of the units of study in chapter 6 specify how many exams and modular exams are conducted each academic year and in which teaching period.

In the following exceptional situations the unit of study description in chapter 6 may stipulate that only one opportunity will be given each academic year for students to take an exam or modular exam:
- if the nature of the education and assessment for the unit of study make it impossible to offer a second opportunity. In this case, the student should receive an indication sometime during the unit of study of whether their performance so far is sufficient for them to pass the exam or modular exam for that unit of study, or,
- if it is not possible to offer a second opportunity due to physical or logistic reasons and the next opportunity cannot be offered until the following academic year, and
- an alternative has been offered that prevents further study delay.

The student will be informed of this exception when they apply for the unit of study and, if possible, before the start of the academic year.

5.4.1 Participation in an exam opportunity

If you participate in a unit of study, you are automatically registered for the corresponding exam or corresponding modular exams.

5.4.2 Request for extra exam opportunity or another exam format

You can submit a request to the board of examiners for an extra exam opportunity.
You can submit a request to the board of examiners to take an exam or modular exam in a different format.
The request must include a good motivation and at least a description of the reason and importance.
The Regulations of the Board of Examiners gives further details on the procedure.

5.5 Modified exam format due to functional disability

Do you have a functional disability or chronic illness, or is there another reason such as pregnancy that means you cannot participate in the regular format of the exam or modular exam? Then you can ask the board of examiners to conduct the exam or modular exam in a format modified to your situation.

The board of examiners will decide, after consultation with you and the examiner where needed, which format can reasonably be used for the exam or modular exam, which facilities will be offered and which different rules will apply.

5.6 Oral exams and modular exams

An oral exam or oral modular exam is conducted by means of a conversation between the examiner(s) and the student. Oral exams and oral modular exams are public. In special cases, the board of examiners can deviate from this rule. This decision will be announced and explained to everyone involved.

5.7 When are the exam results announced?

It depends on the exam format when the results of an exam or modular exam are announced:

- You will be informed of the results of a written exam or written modular exam within at least 15 working days. These results will be recorded in the Alluris student information system.
- The results of an oral exam or oral modular exam will be decided directly after the exam and announced within no more than 5 days. These results will be recorded in the Alluris student information system.
- You will be notified of the results of a practical exam or practical modular exam immediately after the exam, or if that is not possible, within 5 working days. These results will be recorded in the Alluris student information system.
- Department: add any other existing exam formats. Or for example include an exception for exams that are assessed by more than one assessor.

A grade recorded in the Alluris student information system can only be changed in the following cases:

- If you can show an incorrect grade has been recorded in the student information system.
- In cases of fraud, deceit or impersonation.
- If an examiner has revised their assessment for a well-founded reason.
- If you have lodged an appeal to the Examination Appeals Board or the Higher Education Appeals Tribunal against an assessment, the appeal is judged to be valid and the grade has been revised by the examiner.

What happens when a grade is revised after it has been recorded in the student information system? Then the board of examiners, the examiner and you will be notified about this and the reason for the change.

5.8 Exams: review and discussion rights

Did you think the assessment of your exam/modular exam or the discussion were unclear? Then you can ask the lecturer for further explanation. The discussion and individual review are closely monitored to ensure no fraud takes

place during this phase. Discussion and review rights are organised as follows:

5.8.1 Group discussion

Within 10 working days after the results of an exam or modular exam, the examiner organises a group discussion, unless there is clearly no need for this among the students.

5.8.2 Revision and discussion of individual work

After the group discussion or if there was no group discussion, you as an interested party are entitled to review and discuss your own work with your lecturer and the examiner, unless you could reasonably have already done this during the group discussion. You are allowed to review and discuss everything: the assessed exam or modular exam, the questions, assignments and marking system.

5.8.3 Other exam formats

If an exam has been administered in a format that cannot be reviewed or discussed as outlined in the procedure above, the unit of study description in chapter 6 will specify how the review and discussion is organised. The same principles will be guaranteed as in sections 5.8.1 and 5.8.2.

5.9 Exams taken independently of the standard programme

Not applicable

5.10 When and how can you request exemption for an exam or modular exam?

The board of examiners will grant you an exemption for one or more exams or modular exams if you can demonstrate you have the knowledge, understanding and skills and (if relevant) the attitude that are assessed in the exam or modular exam for which you have requested an exemption. You can demonstrate this with:
- evidence showing you have passed a relevant exam in higher education;
- an official report showing recognition of prior learning;
- evidence you gained the required knowledge, the required insight and/or the required skills elsewhere.

The assessment dimensions and assessment criteria of the exams and modular exams apply as specified in chapter 6.

Instead of a grade, you receive the qualification of 'exemption' for an exam or modular exam.

The procedure for granting exemptions can be found in the Regulations of the Board of Examiners.

The board of examiners may designate certain previously completed exams and modular exams, ECTS credits and degree certificates as entitling students to exemption from one or more modular exams. The designated exams, credits and certificates are outlined in an appendix to the Regulations of the Board of Examiners.
The board of examiners may also consider these as grounds for exemptions for one or more exams or modular exams for units of study that are part of the abridged programme as referred to in section 2.5.

5.11 The final Masters assessment

You pass the final Masters assessment if you have passed all of the exams related to that final assessment. This will differ if the board of examiners decides that an extra assessment is needed of your knowledge, understanding and skills. In that case, you will also need to pass that extra evaluation (exam). Only then will you pass the final assessment.

5.11.1 Cum laude

If you pass all the exams that count towards the final assessment with a grade of 8 or higher on your first attempt, you will pass that assessment 'cum laude'. These are the overall exam grades for each unit of study; separate grades for the modular exams are not taken into consideration. If an exam comprises several modular exams, only the grades for the modular exams that were passed on the first attempt will count towards the required grade of 8 for the exam. One exception can be made to this rule for each final assessment. This exception is that a student may retake one modular exam and the highest grade will then count towards whether or not they receive the cum laude distinction.

You may earn no more than 60 ECTS credits worth of exemptions or 'pass' qualifications during the Masters programme.

5.11.2 With merit

If you pass all the exams that count towards the final assessment with a grade of 7 or higher on your first attempt, you will pass the final Masters assessment 'with merit'. These are the overall exam grades for each unit of study; separate grades for the modular exams are not taken into consideration. If an exam comprises several modular exams, only the grades for the modular exams that were passed on the first attempt will count towards the required grade of 7 for the exam. One exception can be made to this rule. This exception is that a student may retake one modular exam and the highest result then counts towards determining whether they receive the with merit distinction.

You may earn no more than 60 ECTS credits worth of exemptions or 'pass' qualifications during the Masters programme.

5.12 Overview of results, supporting documents, and declarations

5.12.1 How to request a – certified – overview of your study results

You can make a printout of your exam results as recorded in the Alluris student information system. If you want to use this overview as an official document at HAN University of Applied Sciences or elsewhere, you can submit a request to the board of examiners for a certified grades list. This certification does not guarantee that the relevant authorities will also consider the document official.

5.12.2 Exam documentation

You will receive signed evidence from the examiner for each exam or modular exam you take. This may be a digitally signed document. This document gives the name and code of the exam and unit of study and your result. The examiner is required to provide you with this evidence.
Keep this evidence in a safe place.

5.12.3 Statement

If you are not entitled to a degree certificate, but you have passed more than one exam, you will receive a certified statement from the board of examiners listing the exams you passed, for which degree programme, how many ECTS credits you earned for these exams and, if applicable, the programme for which the statement is being issued. This statement includes an appendix with a certified grades list.

5.12.4 Module certificate

Not applicable

5.13 Degree certificate, degree and diploma supplement

5.13.1 Degree

Once the board of examiners has confirmed you have passed the final Masters assessment, the HAN Executive Board will award you a Master of Science in Molecular Life Sciences. This degree with specification is also stated on your degree certificate. The related official abbreviation you can place after your name in the Netherlands and abroad is: MSc.

Once the board of examiners has confirmed you have passed the final Masters assessment, the HAN Executive Board will award you a Master of Science in Molecular Life Sciences. This degree with specification is also stated on your degree certificate. The related official abbreviation you can place after your name in the Netherlands and abroad is: MSc

5.13.2 Degree certificate

Once the Institutional Board has awarded the degree and has confirmed that you are enrolled for the degree at HAN and have met all your financial requirements towards HAN, the board of examiners will award you the certificate for the Masters degree and the corresponding diploma supplement.

5.13.3 Different issuing date for Masters degree certificate

You can request the board of examiners to postpone issuing your degree certificate. This postponement can be granted for up to two years.

5.14 Appeal

You can lodge an appeal with the Examination Appeals Board against a decision concerning the education, exams and final assessments within 6 weeks based on the EER.

You can read about which decisions you can appeal and how to do this on HAN Insite under Complaints and Disputes Office:

www.han.nl/insite/bureaukeng

HAN_UNIVERSITY OF APPLIED SCIENCES

6 Description of the education (the unit of study)

See appendix 1 for the details of the units of study

7 Evaluation of the degree programme

7.1 Evaluation structure

A quality framework has been adopted for all HAN degree programmes. This is geared to the accreditation framework of the Accreditation Organisation of the Netherlands and Flanders (NVAO) and in line with the education policy formulated by HAN. This framework stipulates that regular evaluations must be held among students, graduates, professional field and staff.

Assessments are also held by HAN to support the evaluations at degree programme level. Each year all HAN degree programmes participate in the National Student Survey (NSE) in which students indicate how satisfied they are with different aspects of their degree programme.

An alumni surveys is held each year for each degree programme that evaluates how alumni look back on their degree programme and how well it is geared to the labour market in their experience.

All HAN students who leave a degree programme without a degree certificate are contacted to enquire about their reason for leaving. Also, study progress and drop-outs are monitored for each degree programme.

Every six years an accreditation is held by the NVAO, with external reviews beforehand by a committee of experts. Halfway through the accreditation cycle, an audit is conducted by an internal committee complemented by an external expert in the relevant field. The aim is to monitor and test the progress of improvement measures relating to the last external assessment of the degree programme. This internal audit results in a report with improvement recommendations for those responsible for the content of the programme, the degree committee and the institute management.

The Education and Research Service Unit conducts this audit according to established protocol, which includes quality assurance with regards to administrative and educational law and good implementation of the EER components.

7.2 Evaluation by the degree programme

The institute director is responsible for the structure and the quality of the degree programme.

Each year the institute director adopts an annual quality assurance report on the degree programme. This document, along with the internal audit report or review report, forms the basis for dialogue about the quality of the programme. This report concerns the improvement activities that were agreed on for the reported year, how they were executed and what results they delivered.

Based on the analysis of evaluation data for the reported year, a description follows of the improvement activities to be implemented in the current year. The evaluation data come about through evaluations of units of study, annual evaluations and curriculum evaluations by lecturers, students, alumni and the professional field. Also through evaluation studies conducted centrally by HAN.

The programme coordinators and/or the degree committee, curriculum committee and the board of examiners are involved in this cycle at programme level by means of a brief response to this. Their responses are included in the appendixes to the annual report.

7.3 Role of the Degree Committee

The tasks, role and responsibilities of the degree committee in the evaluation are set out in the Regulations of the Degree Committees. The degree committee can also take the initiative to conduct specific evaluation studies or

have them conducted.

7.4 Programme-specific quality assurance

Different stakeholders, which are students, professional field (professional advisory committee, the HAN Research group Industrial Microbiology and diverse other contacts), lecturers and alumni are involved in the quality assurance cycle. They are formally asked about their opinion about various quality aspects of the programme on a regular bases, and are stimulated to give informal feedback. Evaluation scores are compared to targets. Possible causes for scores lower than targets are discussed, and improvement actions are initiated, carried out, communicated and evaluated. By continually going through Deming's Plan-Do-Check-Act cycle (PDCA cycle), the programme aims for continuous improvement of the quality of the programme.

In addition, the external supervisor has the task to give feedback on the realization of the final qualifications, their assessment and teaching supporting students in acquiring these.

HAN_UNIVERSITY OF APPLIED SCIENCES

8 Transition regulations

General provisions

8.1 Changes to EER

A change to the EER can only become effective as of 1 September in the following academic year. Exceptions to this rule are clerical error, force majeure, fulfilment of legal regulations or when the change is in your favour. This chapter contains the rules for the fulfilment of the vested rights and legitimate expectations.

8.2 Credits earned

The result of an exam or modular exam and its corresponding credits remain valid until the board of examiners has made a substantiated decision that the examined material is so outdated that it can no longer be used in the profession and the term of validity has passed as of a date stipulated by the board of examiners.

8.3 Participation in education activities, exam not done or not passed

A student who has participated in the education for a unit of study in the academic year prior to the programme change, but who has not sat for an exam or modular exam or has not passed an exam or modular exam, has a right to repeat the education at least during the academic year in which the change becomes effective, and has a right to at least two opportunities to sit for the relevant exams. The board of examiners can deviate from this in exceptional cases, in the favour of the student. If you like, you can directly choose the new programme structure and register for a renewed or changed unit of study. By doing so, you waive your rights concerning the transition rules.

Programme-specific regulations

8.4 Programme-specific transition regulations

Students who need to take (modular) exams of previous academic years have the right to take old formats of these (modular) exams, equivalent tot current (modular) exams, according to the following transition regulations:

UOS in previous study years	Equal to UOS in 2019-2020	Brief commentary	Option to take old (modular) exams	Deviating provisions with respect to old UOS and (modular) exams
Drug Discovery and Development	Drug Discovery and Development	From 2018-2019 onwards, the Drug Discovery presentation (DRD-PRES) is not marked anymore, but converted to a class activity (poster presentation) in which students have to demonstrate their knowledge and skills at sufficient level	Yes, students of the 2016 and 2017 year group can take the DRD-PRES in the old format	-

Production of Biomolecules 1	**Production of Biomolecules 1**	**From 2018-2019 onwards, the only marked modular exam of POB1 will** be the presentation on gene discovery strategy to optimise microbial production in yeast (POB1-MICRO); **the project proposal (POB1-PP) will be converted to a class activity students have to actively participate and part of the unit of study POB2;** **the assignment on Protein Production under GMP conditions (POB1-ENZ PROD) not part of the examination any longer**	**Yes, students of the 2016 and 2017 year groups can resit the modular exams of POB1 in 2019-2020 (POB1-PP and POB1-ENZ PROD)**	-
Production of Biomolecules 2	**Production of Biomolecules 2**	**In 2019-2020, the examination in POB2 will consist of the theoretical exam (POB2-EXAM) and the assignment Planning and price quotations enzyme production (POB2-PP)**	**no**	-
Vaccines and Diagnostics	**Vaccines and Diagnostics**	**From 2018-2019 onwards, the theoretical exam of the module Vaccines and Diagnostics will not be part of the examination anymore, as the learning goals of this exam are sufficiently covered by the other modular examinations (Vaccine advice proposal and Validation plan)**	**Yes, for students of the 2016 year group**	-
Research and Product Development 1	**Research and Product Development 1**	**From 2018-2019 onwards,** • **-** the “Design of Experiments” will not be a marked document but to a class activity in which students have to demonstrate their knowledge and skills at sufficient level	**Yes, for students of 2016 and 2017 year group**	-
Research and Product Development 2	**Research and Product Development 2**	**From 2018-2019 onward,** **-** the modular exam ‘Quality document’ will be changed into an assignment on quality guidelines; **-** the business plan/case assignment will change to a presentation/pitch in which students have to demonstrate their knowledge and skills at sufficient level	**Yes, for students of 2016 year group**	-
Project Management 1	**Managing Projects 1**	**From 2018-2019 onwards:** **The network analysis (PRJM1-NA) will be part of Professional Conduct (PRJM-PC2); Professional Conduct is split into Professional Conduct 1 (at the workplace) and Professional Conduct 2 (performance in meetings and network analysis)** **From 2019-2020:** **The name of the unit of study changes from “Project Management 1” into “Managing Projects 1”; the assessments are not changed.**	**Yes, students of 2017 year group can take the old examinations Professional Conduct and Network Analysis; Students of 2018 year group complete their unit of study “Project Management 1”**	-
Project Management 2	**Managing Projects 2**	**From 2018-2019 onwards:** • **-** the assessments Professional Identity and Interpersonal Effectiveness will be merged to one assessment “Professional Effectiveness”; and • **-** the assignment “Reflection on project realisation and own contribution” are converted into a class activity students have to actively participate **From 2019-2020:** **The name of the unit of study changes from “Project Management 1”** into “Managing Projects 1”; the assessments are not changed.	**Yes, students of 2016 year group can take the old modular exams of “Project Management 2” Students of 2017 year group complete their unit of study “Project Management 2”**	-

PART 3

2019/2020 REGULATIONS OF THE BOARD OF EXAMINERS FOR THE MASTERS IN HEALTH STUDIES

Physician Assistant, Advanced Nursing Practice, Musculoskeletal Physiotherapy, Neurorehabilitation, Molecular Life Sciences and Arts Therapies & Psychomotricity

Section 1: General Provisions

Article 1.1 Terms and definitions

The terms and definitions applied in these regulations are those set out in Section 1.1 of the Education and Examination Regulations.

Article 1.2 Status and scope of these regulations

1. These regulations contain rules about the duties and powers of the Board of Examiners for the Masters in Health Studies and measures they may take in this context, as well as rules about the implementation of these measures.

2. These model regulations are adopted annually as part of the model degree statute by the Executive Board with approval from the participation council.
   The board of examiners may change paragraphs, articles and sections, provided the changes do not conflict with the degree-specific Education and Examination Regulations (EER), the HAN Student Charter or the Higher Education and Research Act ('WHW').
3. These regulations were adopted by the board of examiners and apply to (the units of learning outcomes/study, exams, integrated exams and final assessments for) the Masters degrees in: Physician Assistant, Advanced Nursing Practice, Musculoskeletal Physiotherapy, Neurorehabilitation, Molecular Life Sciences and Arts Therapies & Psychomotricity

Section 2: Decision-making and Mandates, Tasks and Meetings

Article 2.1 Decision-making and Mandates

1. The chair of the board of examiners signs decisions by the board of examiners, unless this duty has been delegated to someone else.
2. The board of examiners can appoint a managing committee for matters concerning day-to-day affairs. This committee is composed of the chair of the board of examiners and another member and – insofar as this position is occupied – is supported by the official secretary. The managing committee is authorised to make provisions for current matters based on a general mandate. Should situations arise in which the managing committee cannot reach a decision, the situation is presented to the board of examiners as soon as possible for a decision.
3. The board of examiners can be supported in its activities by an official secretary.

4. The duties delegated by the board of examiners are listed in appendix 1 to this set of regulations. The board of examiners remains fully responsible for any duties and/or powers it delegates to others.
5. The duties delegated by or on behalf of the Institutional Board to the board of examiners are listed in an overview in appendix 2.
6. The board of examiners ensures that it regularly receives written reports on the duties and powers that it has delegated to other persons or bodies.

Article 2.2 Duties and Powers of the Board of Examiners

The board of examiners has the following duties and powers:

1. Ensuring the quality of exams, integrated exams and final assessments.
2. Adopting guidelines and instructions in addition to the EER about making objective, reliable, valid and transparent assessments of modular exams, integrated exams and final assessments and grading those exams.
3. Deciding to invalidate results for exams and modular exams and the corresponding ECTS credits. Also deciding on what date the validity of these exam results expires. This is only done in cases where reasoned arguments can be given showing the knowledge, understanding and/or skills are so outdated that they are no longer useful for the profession.
4. Deciding on student requests for exemptions. If a decision is later shown to be based on incorrect evidence submitted by the student, the board of examiners is authorised to withdraw the decision.
5. Deciding that certain previously passed exams and modular exams, certificates and other declarations, diplomas and certificates entitle a student to exemptions for one or more exams and/or modular exams.
6. Determining further rules and regulations regarding possible fraud and/or irregularities on the part of students, prospective students or external students, including any measures to be taken.
7. Adopting policies and rules about how the duties and powers should be performed as described in paragraphs 1, 2, 3, 4 and 5.
8. Ensuring the quality of the organisation of exams and final assessments.
9. When establishing guidelines and instructions as specified in paragraph 2, protocols are used for assessing (final) projects that meet national requirements as far as possible.
10. Appointing examiners and head examiners to administer exams and integrated exams and to determine the results of those exams. The board of examiners sets guidelines about appointing and assigning tasks to examiners for each exam format.
11. Terminating the appointment of examiners.
12. Making proposals to the Executive Board on the discontinuation of a student's enrolment in the event of serious fraud.
13. Advising the Executive Board on the discontinuation of a student's enrolment in a degree programme as a consequence of the student's behaviour in relation to future professional practice.

14. Deciding in the event of a suspicion that a student has committed irregularities and/or fraud and, if necessary, taking measures in that regard, in accordance with the regulations of the board of examiners as laid down by the board of examiners.
15. Deciding on a student's request for an extra opportunity to take an exam or integrated exam.
16. Deciding on student requests to take an exam for a unit of study independently of the standard programme.
17. Deciding whether a student can take exams and integrated exams for the final bachelor assessment before they have passed the final propaedeutic assessment.
18. Deciding whether a student can take exams and integrated exams in a different format from what is set out in chapters 9 of the Education and Examination Regulations.
19. Offering a student with a functional disability or chronic illness or other condition such as pregnancy the option to take exams, modular exams and integrated exams in an adapted format where needed.
20. Deciding on a student's request for an oral exam or an integrated oral exam to be closed to the public. The board of examiners may also decide (in principle) to close certain exams to the public without the student's request in cases where there are special reasons such as company confidentiality during a graduation meeting.
21. Issuing documentation, module certificates and declarations.
22. Contributing to the formulation of the exam policy for the degree programme or group of degree programmes.
23. Advising the faculty board and the institute management about the EERs.
24. Awarding a certificate as proof of passing a final assessment once the Executive Board has declared that the procedural requirements for issue have been met.
25. The requirements for receiving a degree are that:
    - the student is enrolled at HAN University of Applied Sciences;
    - the tuition fees have been paid;
26. Deciding whether or not to grant students' requests for postponement of certification.
27. Issuing a statement of successfully completed exams and/or integrated exams, at the request of a student, in cases where the student has successfully completed more than one exam or integrated exam and to whom a certificate as referred to in article 7.11 paragraph 2 of the Act cannot be issued.
28. Issuing a competence assessment certificate to persons entering the field of teaching from another career background as evidence that they have passed the competence assessment.

Article 2.3 Meetings of the Board of Examiners

1. The board of examiners convenes at least six times a year.
2. The meetings of the board of examiners are scheduled in such a way that they concur with the scheduling cycles of the department(s) and the faculty.
3. The board of examiners decides by a simple majority of votes.
4. If the votes are equally divided, the chair has the deciding vote.

5. At each meeting, the board of examiners ratifies decisions taken in the intervening period by the managing committee based on its general mandate regarding day-to-day affairs, as well as any other decisions taken based on delegated duties/powers.
6. The official secretary to the board of examiners ensures that a report is drawn up of every meeting. The report is adopted at the next meeting. The report includes a list of decisions made during the meeting.
7. The official secretary to the board of examiners ensures that the faculty board, the institute management and any other members of the board of examiners receive a copy of the final report as soon as possible.
8. The official secretary to the board of examiners ensures that the final, anonymised reports of the meetings can be viewed digitally by lecturers from the degree programmes concerned.

Article 2.4 Joint meeting of the faculty board, board of examiners and institute managements

1. The chair of the board of examiners convenes three times each academic year with the chairs of all other boards of examiners within the faculty.
2. The board of examiners convenes at least once each academic year with the institute management.

Section 3: Quality assurance of exams, final assessments and organisation

Article 3.1 Ensuring the quality of exams

1. The board of examiners is responsible for ensuring the quality of exams. (See appendix 3 Decisions about quality assurance of exams and final assessments, June 2016).
2. The board of examiners verifies whether the guidelines and instructions as referred to in article 3.2 are observed in practice and result in high-quality exams.
3. The board of examiners offers suggestions for improvements where needed.
4. Each year, the board of examiners prepares a monitoring plan / quality control plan to ensure the validity, reliability, feasibility and transparency of exams.

Article 3.2 Guidelines and instruction for exams

1. Exams and modular exams are administered and graded by examiners and head examiners appointed by the board of examiners.
2. The examiners and head examiners examine and assess the exams and modular exams based on the criteria listed in the EERs and the guidelines and instructions adopted by the board of examiners.
3. The board of examiners adopts guidelines and instructions regarding:
    - the construction of exams;
    - the administering of exams;
    - the assessment and adoption of the result of exams.

Article 3.3 Ensuring the quality of final assessments

1. The board of examiners is responsible for ensuring the quality of the final assessments. They adopt and follow a policy for this. See appendix 4, Decisions concerning whether students meet exit qualifications.
2. The board of examiners regularly inspects whether the entirety of exams test all of the intended exit qualifications.
3. The board of examiners determines whether a student has the knowledge, understanding, skills and (if relevant) attitude, as described in the EER, required for obtaining a degree. The board of examiners also determines whether to declare a student unsuitable.
4. The board of examiners is authorised to administer their own further investigation/exam to reach a careful decision about the matters outlined in the previous paragraph.
5. The board of examiners periodically reviews the quality of final graduation projects. The board of examiners may have these reviewed by other persons, who then submit a report to the board of examiners.
6. The board of examiners will oppose and counteract any unjustified awarding or withholding of credits by examiners.

Article 3.4 Ensuring the quality of the organisation and procedures for exams and final assessments

1. The board of examiners is responsible for ensuring the quality of the organisation and procedures regarding exams and final assessments.
2. The board of examiners ensures compliance with the guidelines and instructions for administering exams as included in the Regulations of the Exams Office and in article 3.2 paragraph 3. The board of examiners meets periodically with the exams office about this and if needed also with the institutional board.

Article 3.5 External validation of the quality of final assessments

The board of examiners ensures that the quality of the final assessment is validated by external parties. To this end, the board:

- institute-wide and faculty-wide assessment;
- uses a joint protocol for assessing final graduation projects;
- hires external experts to assist in preparing exams and assessment procedures;
- hires external experts to assess exam results;
- hires external supervisors to monitor the quality of the assessment of final graduation projects;

Section 4: Appointment and expertise of examiners

Article 4.1 Appointing examiners and expertise of examiners

1. The board of examiners appoints (external) examiners to construct, administer, assess and grade exams.
2. Depending on their role in the exam process, examiners and head examiners are experts in their subject field. They possess the necessary knowledge and skills to prepare exams, set out methods and standards for assessing exams, organise examinations and analyse the results of exams based on guidelines and criteria for reliable, valid and transparent examinations and assessments.
3. The board of examiners ensures examiners have sufficient expertise. If necessary, the board of examiners can ask the institute management to take the necessary measures to facilitate the professional development of examiners.
4. As a way of ensuring the expertise of examiners and head examiners, the board of examiners has a profile they use when appointing examiners.
5. Examiners are appointed for one or more specific programme components (unit of learning outcomes, unit of study, exam or modular exam, phase, specialisation) and for a specific period.
6. The board of examiners informs examiners about their appointment and the profile description used.
7. If necessary, examiners and other parties involved may be heard by the board of examiners and asked to provide the board with specific information and/or advice.
8. If requested, examiners must be able to provide the board of examiners with materials for evaluating the quality of exams, assessment methods and assessment results (such as learning outcomes, test plans, test matrices, answer keys, assessment schemes, assessment criteria for assignments, the actual exams and/or assignments, the exam results and the analysis of the results).
9. If an examiner does not meet – or no longer meets – the required level of expertise, the board of examiners is authorised to revoke that examiner's appointment.

Section 5: Further rules for decisions regarding individual students

Article 5.1 EER as model document

The EER contains model stipulations regarding exams, modular exams, minors, integrated exams, assessment criteria, exemptions, exams and modular exams taken independently of the standard programme, Dutch proficiency, extended study load, study recommendations and studying with a functional disability, chronic illness or other special condition such as a pregnancy.

Article 5.2 Further rules on exemptions from exams, modular exam and integrated exams

1. The procedure for requesting and granting exemptions is as follows:

   Send the completed Exemption Request form (can be found on #OnderwijsOnline for the degree programme) to Examencommissie.Master-gezondheidszorg@han.nl. You will receive an email confirmation with the date for the next meeting in which your request will be discussed. The

written decision will follow as soon as possible after this meeting.
The procedure describe above for requesting an exemption from the board of examiners is the **regular procedure.**

There is another, shorter procedure. You submit your exemption request to the degree programme.
In some cases, the coordinator for the degree programme has been mandated by the board of examiners to grant exemptions to students who have demonstrable knowledge, qualifications and/or competences. Contact your degree programme for more information; see also the information in this degree statute/EER about whether the student can be granted an exemption and based on which knowledge, skills and background.

Section 6: Irregularities and fraud during exams, modular exams and integrated exams

Article 6.1 Definition of irregularities and fraud

1. An irregularity is defined as "any action or omission by an interested party in which they either intentionally or unintentionally give the wrong impression of their own or one or more other interested parties' knowledge, understanding, skills and (if relevant) attitude."
2. Fraud is defined as "any action or omission of which the interested party knew or should have known that this action or omission made it partly or wholly impossible to form a correct judgement of their or someone else's knowledge, understanding and (if relevant) attitude. And/or intentionally influencing (components of) the exam or exemption awarding process with the purpose of influencing the results of the exam or modular exam or decision about exemption or with the purpose of obtaining a different result for the exam or modular exam or request for exemption."
3. The following situations are in any case considered to be an irregularity or fraud:

    a) intentionally or unintentionally submitting work in a portfolio and/or presenting or submitting work as a group's or an individual's own work (such as a thesis, project, assignment or other written piece for submission), while it was wholly or partly copied or created by the student in unauthorised collaboration with one or more other students; This also includes the following rules:

        i paraphrasing the content of someone else's texts with insufficient references;

        ii using or copying someone else's texts, data or ideas without providing the complete and correct references;

        iii unclearly indicating in your text, for example without quotation marks or some other formatting, that the text has literally been copied from another author, even if you have provided the right references;

        iv submitting text you have previously already submitted or that is comparable to what you have previously submitted for assignments or other exam components;

        v submitting other types of written pieces acquired from a commercial institute or that have been written by someone else (whether or not for a fee);

vi not or barely contributing to a (group) assignment, but placing or having someone else place your name under the (group) work.

b) allowing exam questions and/or answers to be disclosed or obtaining knowledge of these during and/or before the exam sitting;
c) aiding or assisting another student in a way that gives in an incorrect impression of that other student's knowledge, understanding and/or skills;
d) seeking and/or receiving aid or assistance from a fellow student or other person in a way that gives an incorrect impression of the student's knowledge, understanding and/or skills;
e) obtaining access to resources that are not permitted during an exam;
f) using permitted resources during an exam that contain unauthorised notes and/or additions (e.g. margin notes or notes or additions on separate pieces of paper);
g) leaving the exam room and returning to the room during an exam without explicit permission;
h) leaving the exam room with the completed exam or part of it, also in cases when that answer sheet is subsequently handed in to the supervisor or their substitute;
i) making changes to a completed exam already submitted to an examiner or a written exam or integrated exam already assessed by the examiner;
j) sitting an exam under someone else's name, or having another person sit an exam for you;
k) violating the rules that apply to reviewing and discussing marked exams;
l) any other matters or incidents which the board of examiners sees as constituting an irregularity.

Article 6.2 Confiscation of evidence

If there is reasonable suspicion of an irregularity or fraud, the board of examiners, (head) examiner and any other person who is present at an exam or integrated exam on the board's or Institutional Board's behalf are authorised to confiscate materials that may serve as evidence of the irregularity or fraud. After the decision of the board of examiners as referred to in article 6.5 has become final and conclusive, the board will return the confiscated materials to the student.

Article 6.3 Measures taken in the event of fraud and irregularities

1. The board of examiners may impose one or more of the following measures if a student commits an irregularity or fraud during any part of an exam or modular exam:

a) giving a written warning;
b) giving a written reprimand;
c) invalidating an administered exam and the exam result if the board of examiners is unable to guarantee the quality of that exam due to the irregularity or fraud. If an exam is invalidated, this will lead to an exam result of 0;
d) withholding a student's degree certificate (if the irregularity or fraud is not discovered until after an exam has taken place);

e) deciding the degree certificate can only be awarded after the student has retaken an exam in a manner, on a date and at a time to be decided by the board of examiners (if the irregularity or fraud is not discovered until after the exam has taken place);
f) revoking the degree certificate after it has been issued (if the serious fraud was not discovered until after the certificate was issued to the student).

2. In the event of an irregularity or fraud, the board of examiners may deny a student access to one or more exams / integrated exams for a period not exceeding one year;
3. In the event of serious fraud, the board of examiners may recommend that the Executive Board terminate the student's enrolment for the degree programme concerned.
4. If according to the board of examiners an administered exam does not meet the quality criteria for examination as the result of an irregularity or fraud committed by someone else other than the student, the board of examiners may decide to annul all or part of the exam and/or exam results. Invalidating a past exam leads to the exam results being annulled or not being awarded. Students affected by this are offered the opportunity to redo the exam (or part of the exam) concerned.

Article 6.4. Hearing the student, the reporter of the irregularity and any third parties

1. The board of examiners will notify a student immediately, if possible orally but always in writing, of any reported irregularity or fraud involving that student at an exam.
2. The student will be given the opportunity to be heard by the board of examiners before a final decision is made.
3. If the student wishes to be heard, they need to make this known in writing within eight working days of the date on which he or she was notified of the opportunity to be heard.
4. The student will be heard no later than ten working days after receipt of their request.
5. The board of examiners can hear the person who reported the irregularity and any third parties before making a final decision on the irregularity or fraud.
6. Before the hearing takes place, the student is informed of their right not to answer the questions posed by the board of examiners.
7. Any third parties brought along by the student may not be refused. They are permitted to be present as an observer.

Article 6.5 Announcement of decision

1. If the student does not respond in writing within 8 working days of being informed about the possibility to be heard, the board of examiners will presume that the student does not wish to be heard. After expiry of this period, the board of examiners will inform the student in writing of the decision or proposal/recommendation to the Executive Board within 10 working days.
2. If the student, reporter or any third parties are heard, the board of examiners will inform the student in writing within 10 working days after the hearing of the decision or proposal/recommendation to the Executive Board.

Section 7: Degree certificate and diploma supplement

Article 7.1 EER as model document

1. Chapters 3 and 8 of the EER stipulate model provisions with regard to units of learning outcomes / units of study1, exams, integrated exams and degree certificates.
2. The board of examiners uses the formats for degree certificates, diploma supplements and other certificates adopted by the Executive Board (Executive Board decision 2018/1328) and when awarding certificates follows the principles and procedures set out in the notes of that decision.
3. After the board of examiners has established that a student has passed the final bachelor's assessment, that student can submit a request to receive their degree certificate before the set dates. The board of examiners will grant this request, and the student needs to take into account a processing period of at least 10 working days.

Article 7.2 Translation of degree certificate

For translations, graduates can contact a certified translator at their own expense (see: www.ngtv.nl).

Section 8: Annual report of the board of examiners

Article 8.1 Annual reports of the board of examiners and faculty board

1. Each year in November, the board of examiners writes a report on its activities during the previous academic year and sends this to the faculty board.
2. The board of examiners makes use of the guidelines for the annual report.
3. The relevant institute management team receives a copy of the annual report.

Section 9: Final provisions

Article 9.1 Unforeseen circumstances

Matters not provided for by these regulations in which an immediate decision is needed will be decided on by the chair of the board of examiners, provided that doing so falls within the powers of the chair. The chair will communicate their decision to all interested parties as soon as possible.

[1]This should be read as 'units of learning outcomes' for modules that are part of the experiment and 'units of study' for modules not yet included in the experiment or for the full-time format of the degree programme.

Article 9.2 Complaints and appeals concerning decisions and procedures of a board of examiners

1. A student can submit an appeal to the Examination Appeals Board against a decision made by the board of examiners or an examiner within 6 weeks after this decision was announced. The procedure is outlined in the 'Regulations for Legal Protection of Decisions Concerning Education' in the HAN Student Charter.
2. Every decision taken by the board of examiners or individual examiner contains a remedy clause. that stipulates at least the following:
   a. an appeal can be made against this decision within 6 weeks of the announcement;
   b. an appeal can be lodged with the Examination Appeals Board;
   c. The correct and current address details of the Examination Appeals Board;
   d. a reference – for more information – to the 'Regulations for Legal Protection of Decisions Concerning Education' of the HAN Student Charter.
3. If a student wants to file a complaint against an examiner or member of the board of examiners, they can consult the procedure set out in the complaints regulations of the HAN Student Charter.
4. If a complaint or appeal concerns a member of the board of examiners, this member of the board of examiners does not take part in processing the complaint or appeal on behalf of the board of examiners.

Article 9.3 Adoption, effective date and amendments

1. These regulations were adopted by the Board of Examiners for the Masters in Health Studies on 21 May 2019 and come into effect on 1 September 2019.
2. These regulations replace the Regulations of the Board of Examiners for the Masters in Health Studies adopted on 1 June 2018.
3. These regulations will be made available to the students and staff of the degree programme(s) as referred to in article 1.2 paragraph 3 of these regulations by inclusion in the Degree Charter.
4. Amendments to these regulations can be made by the board of examiners in the form of separate decisions. Amendments during the current academic year will be made only if this is necessary for the protection of students' interests.
5. Amendments to these regulations may not have any adverse impact on decisions that were made earlier by the board of examiners and were made based on these regulations.

Nijmegen, 21 June 2019

On behalf of the board of examiners

F. Holweg, chair

HAN_UNIVERSITY
OF APPLIED SCIENCES

Appendix 1: Duties delegated by the board of examiners

Overview of duties delegated by the board of examiners (by board of examiners – mandate giver – mandate decision(s) taken)

	Duties delegated by the board of examiners	Mandated body[2], or job title or specific duties of the mandated staff member,
1	Archiving copies of diplomas and diploma supplements Also archiving certificates	HR Secretarial Office
2	Quality of the organisation of exams	HR Secretarial Office
3	Intended decision-making by managing committee (chair/secr.)	board of examiners
4		
5		
6		
7		
8		
9		
10		
11		

Note:

- The mandate will remain valid unless revoked by the board of examiners and as long as the mandated person remains employed by HAN and performs the duties specified above.
- Unless otherwise explicitly stated, those mandated are not authorised to delegate their duties to third parties.

Nijmegen, 21 June 2019

On behalf of the Board of Examiners for the Masters in Health Studies

F. Holweg, chair

[2]For example, committee or department (managing committee, board of examiners, examination task team, exams office).

[2]The official job titles of employees (e.g. institute director, lecturer, senior lecturer, educator/trainer/advisor, secretary) can be found on HAN Insite under 'Our staff'. A duty is a specific work activity carried out by an officer – and may or may not be officially assigned to or requested of them (e.g. chair of the board of examiners, official secretary, personal tutor, team leader, administrative staff member or examiner).
This column lists the specific duties relevant in the context of the mandate given by the board of examiners.

Appendix 2: Duties delegated to the board of examiners by or on behalf of the Institutional Board

Overview of duties delegated to the board of examiners

	Duties delegated to the board of examiners
1	Awarding degrees (Executive Board)
2	Issuing degree certificates (HMP)
3	Organising and coordinating exams and final assessments (HMP)
4	
5	
6	
7	
8	
9	
10	
11	

Note:

- The mandate will remain valid unless revoked and as long as the mandated party remains employed by HAN and performs the duties specified above.
- Unless otherwise explicitly stated, those mandated are not authorised to further delegate these duties.

Appendix 3

Board of Examiners for the Masters in Health Studies
June 2016
HAN University of Applied Sciences

Decisions about quality assurance for exams and final assessments

Exams and final assessments and their assessment must meet the following quality requirements:

- Validity
- Reliability
- Clarity
- Usefulness
- Efficiency
- Conformity with profile

Promoting assessment validity

Exams are valid if they actually measure what they intend to measure, that is, whether students can do what is set out in the exit qualifications or the learning objectives derived from them.

The exit qualifications describe what students can do and know when they graduate. The HAN degree programmes describe the exit qualifications in the form of competences. These competences are practised and assessed through professional tasks students perform at three levels. When determining whether a student satisfies all the exit qualifications, we check whether each student possesses the competences required at level 3.

The exit qualifications form the keystone for the content and structure of the curriculum, and for all (modular) and (modular) integrated exams.

*The degree programme guarantees **validity** as follows:*

- ***The degree programme focuses on the exit qualifications/competences***
  There is a focus on the exit qualifications throughout the degree programme (regardless of whether they are formulated in terms of competences). This means that assessment always focuses on measuring the students' level of mastery of these competences.
- *The **exam type** is chosen in such a way that:*
  - *it facilitates demonstration of the assessed exit qualifications or the learning objectives derived from them*
  - *the object of the assessment is evident*
- *The degree programme performs a **validity check** (at least once every 2 years)*
  - *The exam should be sizeable enough to exclude the possibility of flukes (not asking everything about very little and nothing about everything). [This also promotes the validity of the final grade!]*
  - *Ensures an appropriate degree of difficulty. Too difficult means that (too many) students who can satisfy the criteria fail, and too easy [this also promotes the validity of the final grade!]*

DECISION

The board of examiners sets the following requirements for assessment criteria for exam assignments and assignments for the integrated exams

1. Exam assignments/assignments for the integrated exam should be formulated in such a way that
   - the assessed exit qualification(s) and (possibly) the learning objective(s) derived from them are stated clearly in the assignment text
   - the result demonstrates whether the students can do what is set out in the assessed exit qualifications and (possibly) the learning objectives derived from them
2. Assessment criteria for projects / (professional) products / presentations / practicals are recorded in an assessment form and clearly linked to (aspects of) the exit qualifications on which the study unit in question is focused.
3. Written modular exams / exams (MC / open questions / essay questions / case study questions) are always compiled on the basis of a specification table that states, for each assessed exit qualification(s) and (possibly) the learning objective(s) derived from this, how many questions will be asked in each (modular) exam and the nature of the questions (multiple choice questions / open questions / essay questions / case study questions).
4. Validity check with reporting.
   Ideally, the validity of the exams would be measured each year and, as a result of this, based on comparisons between cohorts, evaluative questions would be asked about the exam, teaching, academic progress, etc. As this may not be feasible, in view of the small groups resulting from the smaller student numbers for these Masters, the recommendation is once every two years. This means that in addition to elements of the exam construction (level is sufficiently challenging but not too difficult, fits with the degree programme phase, qualifications derived from Dublin Descriptors, repeated examining of qualifications using different exam types or contexts), we analyse the p-value of the exam components and the entire exam. In doing so, we also analyse whether the exam components discriminate between 'stronger' and 'weaker' students, by analysing p-values for three sub-groups, for example (students who score moderately/well, students who achieve a pass grade, students who fail). It is also advisable to measure the distribution of the final results of the exam and subsequently, in the case of deviations, to formulate questions/hypotheses.

Monitoring

The board of examiners performs spot-checks on the validity of the exams and assessments each year. They go through the degree programme's analytical reports and give feedback on these. They also study

the assignment texts and assessment forms, specification tables and associated exam questions, completed assessments and the results of the validity check.

Promoting assessment reliability

The reliability is the degree to which measured results can be relied on, which means the degree to which the scores (assessments) are consistent, accurate and reproducible.
Reliability concerns the question: to what extent are the grades that are awarded not flukes?
Specifically, this means:

- *Examining and assessment allows students who can satisfy the requirements to pass, and the others to fail*
- *Different assessors reach the same result when applying the scoring rules*

The reliability of the final grade is influenced by the following sources:

1. ***Sources of unreliability due to a lack of scoring (rules).***
   - *Grades are not awarded based on **scoring** in accordance with assessment criteria, but based on the "intuition" of the lecturer, who "feels", based on their experience, that a certain grade is due.*
2. ***Sources of unreliability <u>within</u> assessors***
   - *Change of opinion after a certain period of time.*
   - *Different grades given in different contexts (much worse than previous series, handwriting, fatigue)*
   - *Expectations regarding the student's performance*
3. ***Sources of unreliability due to differences <u>between</u> assessors:***
   - *Differing degrees of accuracy*

Based on this it is obviously impossible to achieve 100% reliability in grading, and this would entail taking measures that often bring excessive costs, but the degree programme promotes the reliability of examining by:
Assignment/exam questions:

- *A clear and unambiguous exam assignment [this also promotes the validity of the final grade!]*
- *Clear and unambiguous assessment criteria [this also promotes the validity of the final grade, if there is at least a clear relationship between these assessment criteria and the exit qualifications or learning objectives derived from them!]*
- *Using marking schemes or assessment forms [this also promotes the validity of the final grade!]*

Assessment

- *Assessment is based on the above-mentioned assessment forms/marking schemes; this also promotes the validity of the final grade [if there is at least a clear relationship between these assessment criteria and the exit qualifications or learning objectives derived from them!]*
- *A clear assessment procedure*
- *Multiple assessors, if desirable and feasible, cooperating on the basis of an exam vision.*
- *Exams done by students on the pass/fail borderline are checked by a second assessor*
- *In the case of two or more assessors, some or all questions are assessed by more than one assessor, resulting in an average grade. Adjust very lenient or strict marking*

Reporting inter-assessor meetings

- *Brief account of dialogue content.*
- *Account of standard deviation in scores.*

Measure internal consistency of the exam and qualifications

- *Every two years, or in any case in situations when new exams are used.*

DECISION

The board of examiners sets the following requirements for exam assignments/assignments for the integrated exams and assessment criteria:

1. The assessment forms mentioned under 1.1 are always used/completed when reaching a grade. It can be useful for the assessment to specify when particular scores are selected (e.g. by means of rubrics).
2. A marking scheme will be produced for every written exam (MC / open questions / essay questions / case study questions) that covers, at a minimum:
    a. The essential components of the answer
    b. The maximum score for each question (and ideally, also scoring rules for good components of the answer)
    c. How to get from scores to grades (transformation of scores into grades, including the minimal score for the pass/fail borderline (the cut-off point))
3. Every assessment form for projects / (professional) products / presentations / practicals contains minimal scoring rules that state
    a. The maximum number of points per criterion
    b. How to get from scores to grades (transformation of scores into grades, including the minimal score for the pass/fail borderline (the cut-off point))
4. Reporting inter-assessor meetings
5. Measuring the internal consistency (Cronbach's alpha) of qualifications, specified in criteria. The reliability of the measurement is enhanced by using several criteria (measuring points) for each qualification in exams.

Monitoring

The board of examiners will conduct spot-checks on the reliability of assessments every year, by asking degree programme committees randomly to retrieve, assess and report on completed assessment forms and marking schemes used in relation to students' answers.

Promoting clarity for students

The exam satisfies the clarity requirement if

- *Students have advance knowledge of all the relevant information about the exams (exam type; what is assessed; how it is assessed; who is assessing; when it is assessed)*
- *The students have timely advance knowledge of how the exams and assessments are held, allowing them to take account of this when preparing*

DECISION

The board of examiners sets the following requirements for degree programmes in relation to the clarity of exams:

Degree programme statutes and SU manuals will include
(A reference to) information about

- The exam type: in the degree programme statute, in the SU description + in the course handbook for the SU;
- What is assessed (assessment criteria): in the course handbook for the SU; assessment criteria on assessment forms.
- How it is assessed (scoring rules and cut-off point methods): general basic principles in SU and specified in assessment form as appendix to the course handbook
- How much time is available to sit the exam: in course handbook
- Deadlines: in course handbook
- When assessment will take place: period in TER
- How the result will be announced: procedure in degree statute, TER and result in student tracking system
- Applicable rules in relation to fraud/plagiarism: in the TER
- Applicable rules and options for students with a disability: in TER

Monitoring

Each year, the board of examiners will perform spot-checks on the clarity of assessments for students by asking degree programmes to show, in the case of certain exams, that students received the right information in a timely manner.

Promoting the usefulness of assessment

An exam is useful if the following requirements are met:

- ***Fair**: all students are given an equal opportunity to demonstrate what they can do. This means, for example, that facilities are provided for students with a functional disability, so that they, too, can show what they are able to do.*
- *It is **feasible in the time available** for all students. The study load is calculated appropriately. For final assessments, all students are given sufficient time during the education to finish the exam in its entirety (if speed is not an assessment criterion).*
- ***Feasible**: not too complicated to be carried out and organised.*
- ***Practice-based:** students experience exam products as relevant products in their (professional) practice.*
- ***Topical**: exam products make reference to actual sources for BOKS and situations encountered in the field.*

DECISION

The board of examiners sets the following requirements for degree programmes in relation to the usefulness of exams:

1. Degree programmes take account of the usefulness criterion when producing exam assignments/assignments for the integrated exam
2. When examining, the degree programmes give all students sufficient time to complete the entire exam, when speed is not a criterion
3. Degree programmes provide facilities for students with a functional disability and publish these beforehand in the degree programme statute/TER

Monitoring

The board of examiners will investigate indications that exams and assessments lack usefulness, by screening evaluations of the degree programmes.

Promoting the efficiency of examining

An exam is useful if the following requirements are met:

- ***Efficient:***
  No unnecessary examination of the same thing in the same way.
  No unnecessary inclusion of criteria and qualifications in an exam.
  The exam does not take up a disproportionate amount of the students' and lecturers' time.
  Some examining types take so much time that hardly any time is left for education and study.
- ***Promotes sufficient study practicability:***
  The structure of exams stimulates progress in the student's learning process towards the exit level.

DECISION

The board of examiners sets the following requirements for degree programmes in relation to the efficiency of exams:

1. The exam policy guarantees that qualifications are in principle examined twice, but it is clearly set out how the exam type and exam context differ.
2. The degree programme evaluates the efficiency of the exams with students and lecturers.
3. In the exam policy, the degree programme explains how the order of the exams stimulates academic progress.

Monitoring

Each year, the board of examiners goes through reports on evaluations and the degree programmes' exam policy.

Conformity with profile

The exam satisfies the requirement of conformity with the profile if

- *It is clear how the exam structure and exam type fit with the given Masters profile. Research plays a particularly important role in the profile of these professional Masters.*
- *The exam contents can be traced back to the profile. The exams form meaningful wholes.*
- *There is sufficient variety between the exams to develop the diverse roles linked to the profile of the Master.*

DECISION

The board of examiners sets the following requirements for degree programmes in relation to exam conformity with profiles:

- The exam policy describes the above-mentioned points regarding conformity with the profile.

Monitoring

The board of examiners goes through the exam policy of the degree programmes each year.

19-5-2016
The Board of Examiners For Masters In Health Studies
on their behalf, the chair,
Dr M. Adriaansen

Appendix 4

HAN_UNIVERSITY OF APPLIED SCIENCES

Board of Examiners For Masters In Health Studies June 2017
HAN University of Applied Sciences

Decision in relation to establishing whether a student satisfies the exit qualifications

DECISION

The board of examiners sets the following requirements for degree programmes in relation to establishing whether students satisfy the exit qualifications:

1. The exit level is determined by means of assessment forms, which clearly show which exit qualifications are assessed with which criteria.
2. Assessments of the exit level are carried out by at least one independent, specialised assessor, if possible supplemented with a representative from the professional field for which the students are being trained.
3. Both assessors are appointed as examiners by the board of examiners. The CVs of both assessors, showing they have sufficient substantive expertise in the field and the level of the exit qualifications, should be submitted to the board of examiners, unless the assessors were already appointed by the board of examiners on an earlier occasion.
4. The assessments are entered into the student tracking system.
5. If the student passes the required assessments, the ECTS credits are granted.
6. A list of final assessments is subsequently produced (in Alluris or otherwise), which is put to the board of examiners for approval.

Monitoring

Each year, the board of examiners will perform spot-checks on whether the degree programmes have followed the above guidelines.

The board of examiners reserves the right to be present at assessments on an occasional basis.

21 June 2017
The Board of Examiners For Masters In Health Studies
on their behalf, the chair,
Dr M. Adriaansen

PART 4

Regulations of the exam office

Not applicable to master's programmes.

PART 5

REGULATIONS OF THE PROGRAMME COMMITTEE 2019-2020

Section 1 Introductory provisions

Article 1 Status and definitions

1. These regulations are regulations as defined in article 25.4 of the HAN administrative and management regulations.
2. These regulations are applicable to the degree committee of the Master of Molecular Life Science degree course
3. The definitions and provisions from the glossary in Appendix 1 to the degree statute are applicable to these regulations.

Section 2 Degree Committee

Article 2 Establishing degree committee(s)

1. A degree committee will be established for each degree course or group of degree courses.
2. If a faculty comprises only one degree course, the duties and powers of the degree committee will be exercised by the sub-council.
3. If a degree committee is established for two or more degree courses, that degree committee will be referred to as a joint degree committee. The decision to establish or dissolve a joint degree committee will be taken by the programme council, and it will require the consent of the institute council. The institute council will consult the relevant degree committees with regard to the decision whether or not to give its consent.
4. The provisions in these regulations also apply to joint degree committees, unless the nature of the provision precludes such application.
5. One or more divisions may be set up within a degree committee if required. A division can be set up as needed according to the degree format, according to a special feature of the degree course (e.g. English-taught), according to the location of the degree course or according to any other particulars of the degree course.
6. The degree committee for the degree course Master of Molecular Life Science has been established for one degree course.

Article 3 Joint Assembly

If the degree courses of an institute do not have a joint degree committee, all of the degree committees within that institute will convene in a joint session at least 1 time a year to discuss shared matters of concern, including at least those matters specified in article 27.4 of these regulations.

Article 4 Composition of the degree committee

1. The degree committee consists of 10 members.
2. Half of the members of the degree committee will consist of students from the relevant degree course, with the other half of the members of the degree committee consisting of staff members from the relevant degree course.
3. No individual belonging to the programme council or institute management, employed as an education manager or performing the duties of a course coordinator may simultaneously be a member of the degree committee.

Article 5 Appointment term

1. The members of a degree committee and members of the joint assembly appointed from among the student body serve for terms of two years. The members of a degree committee and members of the joint assembly appointed from among staff members serve for terms of four years.
2. The term begins on 1 September.
3. All members step down simultaneously at the end of their terms.

4. At the end of their terms, members of a degree committee and members of the joint assembly may be re-appointed, on the understanding that members appointed from among the staff may serve for two consecutive terms and may not be re-appointed again after those two terms until they have had a one-term break from serving on the committee. After stepping down, members appointed from among the student body may be re-appointed for a maximum of four consecutive academic years.

Article 6 Termination of membership

1. Membership in a degree committee and the joint assembly will end:
   a. upon the expiration of the term, unless the member is re-appointed;
   b. before the end of the term:
      - in the event of death;
      - in the event that the composition of the degree committee no longer meets the requirements specified in these regulations;
      - in the event that the lecturer is no longer employed at the relevant institute or is no longer affiliated with the relevant degree course;
      - in the event that the student member has quit the degree course.
2. A member of the degree committee may terminate the membership at any time by withdrawing the membership in writing, stating the reason, addressed to the institute management.

Article 7 Composition

1. The degree committee will be composed by nomination and appointment.
2. A review will be conducted each year to determine whether this method of composition is still appropriate.

Section 3 Elections

As the degree committee opts for nomination and appointment of the composition the provisions of section 3, described in article 8 up until article 15, do not apply.

Section 4 Appointment

Article 16 Appointment

The members of the degree committee are appointed by the institute management.

Article 17 Procedure

1. At the opening of the academic year, the members of the degree committee's student division will submit at least one student from each degree course (belonging to the group of degree courses) to the institute management for nomination, with due consideration of article 4. The submission will be compiled by the degree committee of the relevant degree course, or on behalf of the institute management.
2. Prior to the expiration of the term, the members of the degree committee's staff division will submit 2 staff members from each degree course (belonging to the group of degree courses) to the institute management for nomination for the coming term, with due consideration of article 4. The submission will be compiled by the degree committee of the relevant degree course(s), or on behalf of the institute management.

Article 18 Interim appointment

1. In the event of an interim vacancy on a degree committee the institute management will appoint a replacement member. The appointment procedure specified in article 17 will be followed.
2. The replacement member must be appointed within four weeks of the opening of the interim vacancy.
3. The interim replacement member will step down at the same time that the person being replaced would have stepped down.

HAN_UNIVERSITY
OF APPLIED SCIENCES

Section 5 Positions and performance

Article 19 Positions

1. The degree committee will elect one of its members as chair and one as secretary, in addition to electing two members as deputies.
2. A degree committee will be represented by either the chair or the respective deputy.

Article 20 Decision-making

1. The degree committee will take decisions by a simple majority of votes. Abstentions will not be counted. Votes may be held only if a majority of the members are present at the meeting.
2. Voting will take place without the presence of the management or discussion partner.
3. The members of the degree committee will advise and vote independently and unbound by any instructions.
4. In the event of absence, the absent member may vote by proxy. Proxies must be submitted in writing at the beginning of the meeting. A member may cast only one proxy vote for another member at a time. The proxy will vote independently and unbound by any instructions. Proxies will be counted when determining the quorum for the meeting.
5. Anyone who is involved in performing the duties of the committee and who therefore has access to information that is known to be or could be reasonably expected to be of a confidential nature will be bound to confidentiality.
6. Where applicable, the degree committee will ensure that the viewpoints represented by the minority of the votes cast are also communicated to the programme council and/or the institute management.
7. The degree committee will ensure that its resolutions, recommendations and proposals are available for inspection in a place accessible to the lecturers and students of the relevant degree course or institute.
8. As this programme committee deviates from paragraph 4.2 in not having an equal number of student and staff members, all student members together carry half of the voting weight and all staff members together carry half of the voting weight. Thus, each student has a voting weight of 50% divided by the number of student members, and each staff member has a voting weight of 50% divided by the number of staff members.

Article 21 Meetings

1. The degree committee will meet 4 times a year and also at any time at least half of the members of the degree committee request a meeting. Meetings will be scheduled by the course coordinator.
2. The members of the degree committee will receive a written invitation to the meeting no later than five working days before the meeting. The invitation will be accompanied by an agenda.
3. The meeting documents will be sent to the members of the degree committee no later than four working days before the meeting. If the documents are sent later, the members may decide by majority of votes not to address the meeting documents.
4. The degree committee may request information from experts during the meeting. The secretary will be informed about the expert at least seven days before the meeting.
5. The degree committee may compose a temporary committee from among its members in order to prepare a topic. This committee will report to the degree committee.

Article 22 Public nature of meetings

1. The meetings of the degree committee will be public unless the degree committee decides otherwise. The degree committee will determine whether to hold a closed meeting in preparation for a public meeting. No resolutions may be passed in closed meetings.
2. The degree committee must hold at least two public meetings a year. The dates of the public meetings will be scheduled in consultation with the course coordinator and in a way that they concur with the official HAN academic calendar.

Article 23 Reporting procedure

1. The secretary of the degree committee will prepare a report of each meeting.
2. This report must contain at least:

- the date, time and location of the meeting;
- the names of the members who are present at and absent from the meeting;
- the agenda items;
- the main discussion points;
- any explanations of votes;
- the recommendations;
- the resolutions concerning recommendations, noting any votes and results of votes;

3. A draft version of the report will be sent to the members of the degree committee no later than 15 working days after the meeting, after which the report will be confirmed in the next subsequent meeting.
4. The reports of the public meetings of the degree committee will be made available in digital format to the lecturers and students of the relevant degree course.

Article 24 Contact with management

1. The programme council, the institute management and the course coordinator of the relevant degree course will promptly and without request provide the degree committee with all information they might reasonably or justly need to fulfil their duties. Upon request, they will promptly provide the degree committee with all information the committee may reasonably or fairly deem necessary to fulfil its duties.
2. At least twice a year, the degree committee is authorised to invite the institute management to discuss the intended policy based on the agenda that it has prepared.
3. At the opening of the academic year, the degree committee will prepare a policy plan with its key policy points for the coming academic year. The policy plan will be shared with the institute management and, if necessary, with the programme council.
4. At the request of the institute management, its designated deputy or at the request of the degree committee, the institute management or its designated deputy will attend the meetings or parts of the meetings of the degree committee.
5. The institute management will be responsible for ensuring the students and staff of the relevant institute are sufficiently informed of the existence and performance of the degree committee.

Article 25 Annual reporting procedure

1. No later than November of each year, the chair of the degree committee will submit a written report to the institute management concerning the duties and performance of the degree committee during the previous academic year. The chair will send the report to the programme council and institute council for inspection.
2. The report will contain information on at least the following points:
   - the composition of the degree committee
   - the degree committee's vision on its duties and procedures;
   - the degree committee's policy plan and evaluation of its policy plan;
   - the recommendations and resolutions issued by the degree committee, including requests for consent;
   - the board's reaction to the recommendations and resolutions;
   - conclusions and recommendations.
3. The written report referred to in paragraphs 1 and 2 must at any rate be made available digitally and, if requested, in hard-copy format to the staff and students of the institute or degree course(s) concerned.

Article 26 Contact with the institute council

The chair of the degree committee will ensure that consultation with the institute council (or its chair) is held as needed.

Section 6 Duties and powers of the degree committee

Article 27 Mission of the degree committee

1. The degree committee has the duty to advise on the promotion and safeguarding of the quality of the degree course.
2. The degree committee will also be charged with the following duties:

- annually assessing the operational methods of the education and examination regulations (EER) of the relevant degree course;
- advising or issuing proposals to the institute council, the programme council or the institute management on all other matters concerning education in the relevant degree course(s) when requested or upon its own initiative. The committee will send these recommendations and proposals to the institute council for inspection.

3. A division of the degree committee will be charged with advising the degree committee on the following:
   - promoting and safeguarding the quality of the degree course;
   - annually assessing the implementation methods of the EER of the relevant degree course;
   - advising or issuing proposals to the degree committee on all other matters concerning education in the relevant degree course(s) when requested or upon its own initiative
4. The joint assembly has the following duties:
   - discussing the separate recommendations on the EER from the degree committees belonging to an institute, in order to reach a joint resolution in the event that the EER is adopted at the institute level;
   - discussing the separate assessments of the degree course(s) concerning the implementation of the EER in order to reach a resolution on the implementation of the EER at the institute level;
   - advising the institute management, programme council and/or institute council on all other matters concerning education in the relevant degree course(s) at institute level when requested or upon its own initiative.

Article 28 Right of consent

1. The degree committee has right of consent concerning the administrative and management regulations in so far as:
   - they specify a manner of composition other than election for the degree committee;
   - they concern the annual assessment of the appropriateness of this other method of composition;
   - they concern the topics referred to in paragraphs 3 to 8 of article 10.17.
2. The degree committee has right of consent concerning the EER of the relevant degree course in so far as they concern:
   - the manner in which education is evaluated within the relevant degree course;
   - the content of the graduation specialisations within a degree course;
   - the quality of the knowledge, insight and skills that students should have acquired upon completion of the degree course;
   - the organisation of practical exercises, as needed;
   - the study load of the degree course and each of its units of study;
   - if applicable, the selection procedure of students for special programmes within a degree course aimed at helping students attain a higher level of knowledge;

Article 29 Right to prior consultation

The degree committee has a right to prior consultation concerning the EER of the relevant degree course in so far as it concerns:
- the content of the degree course and the exams associated with it;
- any further rules on issuing study recommendations for the propaedeutic phase and further rules on issuing referrals in the propaedeutic phase if a degree course includes more than a graduation specialisation after the propaedeutic phase;
- the number and order of exams, as well as the times at which they may be administered;
- the full-time, part-time or work-study structure of the degree course;
- where necessary, the order in which, time frame within which and number of times each academic year that students are to be offered the opportunity to take exams and final assessments;
- where necessary, the extension of the validity term of passed exams, subject to the authority of the board of examiners;
- the method used to administer exams, whether orally, in writing or otherwise, subject to the authority of the board of examiners to decide on a different method in special cases;
- the manner in which students with disabilities or chronic illnesses are to be given the opportunity to take the exams;
- the public character of exams that are to be administered orally, subject to the authority of the board of examiners to decide differently in special cases;
- the time frame within which the results of an exam are to be posted, along with circumstances under

which exceptions may be made to this time frame;
- the manner and term in which individuals who have taken a written exam will be allowed to review their work after it has been assessed;
- the manner and term in which questions and assignments made or given as part of a written exam may be reviewed, as well as the standards according to which the assessment was performed;
- the grounds upon which the board of examiners may grant exemptions for one or more exams based on previously passed exams or final assessments in higher education or based on knowledge and skills acquired outside the context of higher education;
- where necessary, the requirement to pass certain exams before admission will be granted to take other exams;
- where necessary, the requirement to participate in practical exercises for the purposes of admission to taking the relevant exam, subject to the authority of the board of examiners to grant exemptions from this requirement, whether or not that is conditional upon alternative requirements;
- the monitoring of study progress and individual personal tutoring;
- the actual design of the education.

Article 30 Conditions for consent and consultation

1. The programme council and/or the institute management will ensure that:
   a. recommendations are requested at such a time that it can actually bear an influence on the decision-making;
   b. the committee has the opportunity to consult with the relevant board before the recommendation is issued;
   c. the committee is notified in writing as quickly as possible concerning the manner in which the recommendations will be acted upon.

Article 31 Procedure for consent and consultation

1. The degree committee will notify the programme council and/or the institute management in writing about whether the degree committee has granted consent or what the degree committee's recommendation is as soon as possible, but no later than six weeks after consent or consultation has been requested.
2. The degree committee and the institute management may agree to extend the term specified in the preceding paragraph, or to shorten it due to the urgency of the decision to be taken, or may agree whether the decision to be taken is required in order to comply with a legal prescription.
3. If the degree committee has not notified the programme council and/or the institute management of its recommendation or decision concerning the requested consent within the term referred to in the first paragraph of this article, or within the extended or shortened term, the degree committee will be regarded as not having exercised its powers.
4. The degree committee may consult with students and/or staff members from the relevant degree course prior to taking a decision on a request for consent or before issuing a recommendation.

Article 32 Deviating from a recommendation

1. If the programme council and/or the institute management does not wish to follow all or part of a recommendation from the degree committee, it will notify the degree committee of this, along with its reasons, within four weeks. The programme council and/or the institute management will ensure that the degree committee has the opportunity to engage in further consultation with the relevant board before taking a definite decision.
2. The programme council and/or the institute management will suspend the execution of its decision for four weeks after the day on which the degree committee announced its decision, unless the committee has no objection to the immediate execution of the decision.
3. The programme council and/or the institute management will notify the degree committee, the institute council and, in the case of a decision by the institute management, the programme council in writing of the definite decision, noting that the decision deviates from the degree committee's recommendation.

Article 33 Right of initiative

1. If the degree committee makes a proposal as referred to in article 27.2 of these regulations, upon request or at its own initiative, to the institute council, the programme council or the institute management, the institute management and/or the programme council will respond to the

proposal within two months of receipt. The degree committee will send these recommendations and proposals to the Participation Council or the relevant institute council for inspection.

Section 7 Quality assurance

Article 34 Quality assurance

1. At the opening of the academic year, the degree committee and the course coordinator will make agreements concerning the manner in which the quality assurance is performed.
2. At the closure of a module, the students of the respective module will be offered an anonymous questionnaire digitally regarding the lectures, assignments and relevant staff member of the respective module.
3. At the closure of a module, a personal session will be offered with a staff member of the degree course and the class of the respective module to give feedback and evaluate the module that is (about to be) closed.
4. After each graduation session, the graduate, his/her workplace advisor and the external advisor involved in the graduation session are asked to give their opinion about the graduate's qualifications and the course of the graduation (session) by filling in a questionnaire.
5. The core team members have regular discussions (2 per year) with the Professional field advisory board and with other representatives of the field to align the programme with needs in the professional field.
6. Alumni are invited to give their input on the programme's quality and effects for them (after about 5 years).
7. The programme is audited by education and work field experts every 6 years in the course the accreditation by the NVAO. In addition, a mid-term HAN-internal audit takes place in which the programme receives feedback on its quality based on the NVAO quality standards.
8. The degree committee is involved in quality assurance by giving feedback and approving the annual Degree Statute/Education and examination regulations, and by giving feedback on various aspects (requested and on own initiative) throughout the year.
9. The core team discusses incoming feedback, involving other stakeholders if required, and decides on improvement actions. The core team also safeguards the realisation of improvement actions.
10. An annual report on the programme quality and planned improvement actions is written by the programme team.

Article 35 Involvement in accreditation

Within the context and for purposes of the accreditation of the degree course:
- the degree committee will provide a recommendation for the self-evaluation of the degree course upon request from the institute management or programme council;
- in certain cases the degree committee will have the right to prior consultation with regard to the recovery plan.

Section 8 Disputes

Article 36 Access to the Disputes Committee for participation

The Disputes Committee for Participation will inspect disputes between the degree committee, the programme council or the institute management with regard to:
a. the application of the regulations of the degree committee;
b. disputes arising from articles 27 to 30 of these regulations.

Article 37 Amicable settlement

In the event of a dispute between the degree committee and the institute management and/or the programme council, the Executive Board will investigate the possibility of amicable settlement. If this is not possible, the institute management, the programme council or the degree committee will submit the dispute to the Disputes Committee for Participation.

Article 38 Binding judgement of the Disputes Committee for Participation

The Disputes Committee for Participation is authorised to effect an amicable settlement between parties. If no amicable settlement is possible, the disputes committee will resolve the dispute by issuing a binding judgement, testing whether:
a. the programme council and/or the institute management has adhered to the requirements of the law and the internal regulations for degree committees;
b. the programme council and/or the institute management could have reasonably arrived at the proposal or decision in the consideration of the interests involved;
c. the programme council and/or the institute management has acted negligently with regard to the degree committee.

Article 39 Suspended execution of a decision

If the dispute concerns the choice whether or not to follow the recommendation or not to follow part of the recommendation given by the degree committee, the execution of that decision will be suspended for four weeks, unless the degree committee has no objection to the immediate execution of the decision.

Article 40 Permission in the absence of consent

If the programme council and/or the institute management has not received consent from the degree committee for its intended decision, the programme council and/or the institute management may request permission from the Disputes Committee for Participation to take the decision, contrary to the provisions of article 31. The Disputes Committee for Participation will grant permission only if the decision of the degree committee not to provide consent is unreasonable or if compelling organisational, economic or social reasons call for the intended decision of the programme council and/or the institute management.

Section 9 Facilities

Article 41 Facilities for degree committees (and their members)

1. The programme council and the institute management will grant to the degree committee the use of the facilities to which the committee may have access and that the committee could reasonably need to fulfil its duties, including in any case administrative, financial and legal support.
2. More specifically, the degree committee is entitled to:
   - meeting space;
   - facilities for the reproduction/distribution of meeting documents.
3. The programme council and the institute management will allocate a training budget to the members of the degree committee. The training budget will be determined at the opening of the academic year, in joint consultation between the degree committee and the institute management and, in any case, it will allow the members of the degree committee to participate in the training and professional development opportunities offered by HAN Academy. The training budget for the degree committee of the Master of Molecular Life Science degree course amounts to 2,000 euro. per academic year .
4. The members of the degree committee who are employed as staff members will have the opportunity to participate in this training during working hours and with retention of salary.
5. The programme council and the institute management will allow the degree committees the opportunity to meet during working hours whenever possible. Each student and staff member of the degree committee will be facilitated for all degree committee activities for 20 hours each academic year, with the position of chair receiving additional facilitation of 40 hours each academic year.

Section 10 Final provisions

Article 42 Legal protection

The Executive Board, the programme council, the institute management and the course coordinator of the Master of Molecular Life Science degree course will ensure that the members of the degree committee and the members of the joint assembly are not disadvantaged in their position and/or interests in relation to the institution on account of their membership in the degree committee.

Article 43 Unforeseen circumstances

Matters that are not provided for in these regulations and for which an immediate decision is needed by the degree committee will be decided upon by the chair of the degree committee or the chair of the joint assembly. The chair must communicate this decision as soon as possible to the other members of the degree committee, as well as to the institute management, the relevant course coordinator(s) and the programme council.

Article 44 Effective date

These regulations were adopted by the programme council on 10 July 2018 and came into effect on 1 September 2018.

Appendix 1

Description of the units of study.

Description of the education (the unit of study)

This chapter describes the education provided in your degree course in the form of a curriculum overview and description of the units of study, starting with the units of study in the propaedeutic phase, then those of the post-propaedeutic phase and finally those of the minors.

Full-time	**Part-time**
Fundamentals (8 credits)	Fundamentals (8 credits)
Project Management 1 (15 credits)	Project Management 1 (15 credits)
Research and Product Development Skills 1 (23 credits)	Research and Product Development Skills 1 (23 credits)
Drug Discovery and Development (9 credits)	Drug Discovery and Development (9 credits)
Production of Biomolecules 1 (5 credits)	Production of Biomolecules 1 (5 credits)
Production of Biomolecules 2 (4 credits)	Production of Biomolecules 2 (4 credits)
Project Management 2 (7 credits)	Project Management 2 (7 credits)
Research and Product Development Skills 2 (10 credits)	Research and Product Development Skills 2 (10 credits)
Vaccines and Diagnostics (9 credits)	Vaccines and Diagnostics (9 credits)
Graduation Project (30 credits)	Graduation Project (30 credits)

6.1 Units of study

General information	
Name of unit of study	Fundamentals
Code for unit of study	HMP-MMLS-FUND
Teaching period	September - December 2019
ECTS credits	8
Study load in hours	224
Study hours (contact hours)	60
Entry requirements for unit of study (in categories)	All assessments of this unit of study have to be sufficient.
Content and organisation	
General description	The unit of study Fundamentals aims at refreshing the knowledge and skills of a bachelor in bio-*molecular* research & development. Subjects include molecular biology, cell biology, biochemistry and statistics. Special focus is on the techniques used in the field. Bio informatics will consist of consulting databases and basic online tools. Writing, reading and understanding of scientific articles are subject of the unit of study as well.

	2-weekly assignments on various subject areas will support students in (re)acquiring the knowledge and skills and in becoming familiar with the education programme.
Exit qualifications	**Competence 3: Design, analysis and control of experiments**
Professional task	to apply fundamental knowledge in the area of molecular life sciences to find sustainable solutions for these needs
Cohesion	At the end of the module, all students have the fundamental knowledge and skills at post-Bachelor level that enable them to subsequently acquire the knowledge, skills and Competences characteristic for this master in the following units of study.
Mandatory participation	- Start assessment - Presentations of Assignments
Maximum number of participants	-
Compensation options	None
Activities and/or instructional formats	<u>Introduction to the programme and the facilities</u> On the first day, students receive programme material which is introduced by the programme coordinator. Furthermore, the programme aims, structure, contents and organization are explained and students are introduced to the campus facilities. <u>Weekly assignments</u> Students will work on weekly assignments (part-time students: 2 weeks) which will help them to actively acquire the required knowledge and skills. The weekly assignments cover a large part of the BoKS of this unit of study. The supporting lectures, workshops and trainings are planned to help students to work out their assignments and to achieve their learning goals: <u>Lectures:</u> - Methods in biochemistry, molecular and cell biology - Overview: The genome - Properties of biomolecules - (Regulation of) gene expression in prokaryotes and eukaryotes - Overview: Signal transduction - Overview: Cell cycle - Overview: Intracellular trafficking - Cell metabolism <u>Workshops:</u> - Statistics: Introduction and basic statistics for biological data analysis <u>Trainings:</u> - Bioinformatics: Using databases, Blast search, Tools for gene cloning, Databases for metabolic pathways, Genome databases, - Introduction digital learning environment ‘Scholar’ <u>Social programme:</u>

	A social programme is part of this unit of study. During this programme, students and teachers can get to know each other personally and have fun together. The activity will be a surprise!
Required literature / description of learning material	❖ Reader Fundamentals ❖ Original research articles are provided with the weekly assignments
Recommende literature	❖ Alberts, Johnson, Lewis, Morgan, Raff, Roberts, and Walter, (2015 or 2017). *Molecular Biology of the Cell*. (6th or 7th edition). Garland Science: ❖ Lodge, Lund & Minchin (2007): *Gene Cloning, Principles and Applications.* Tayler & Francis Group ❖ Berg, J.M., Tymoczko, G. Gatto J., Stryer, L. (2015 or 2019). Biochemistry. (8th or 9th edition). W.H. Freeman. ❖ Samuel, M.L., Witmer, J.A., & Schaffner, A. (2011 or 2015). *Statistics for the Life Sciences.* (4th or 5th edition). Pearson. ❖ Agostino, M. (2012). Practical Bio-informatics. Garland Science.
Required software / required materials	Computer and internet connection SPSS software
Extra contributions (EER 2.7)	-
Examination	
Name and code [exams or modular exams]	*See exams of the UOS Introduction below this table*
Assessment criteria	In the exam, the student explains and applies the body of knowledge and skills to design and analyse experiments and data and explains and interprets the theoretical background, aims, methods, results, conclusion and discussion of a current scientific article. The article is provided at the beginning of the exam.
Exam and modular exam format(s)	Exam
Weight factor of modular exam	100%
Minimum result	5.5
Exam opportunities	2 chances per study year; Chance1: December 2019 Chance 2: January 2020
Number of examiners for individual exam type	2 for construction and evaluation of test and answer model, 1 for assessment, 2nd in case of doubt
Permitted resources	Calculator
Discussion and review	Within 10 working days after the results of an exam or modular exam, the examiner organises a group discussion, unless there is clearly no need for this among the students. After the group discussion or if there was no group discussion, you as an interested party are entitled to review and discuss your own work with your lecturer and the examiner, unless you could reasonably

	have already done this during the group discussion. You are allowed to review and discuss everything: the assessed exam or modular exam, the questions, assignments and marking system.

Exam of the UOS Fundamentals

<table>
<tr><td></td><td colspan="3">Assessment criteria/ Indicators / requirements</td></tr>
<tr><td></td><td>Competence indicators</td><td>Body of Knowledge and Skills</td><td>Assessment criteria</td></tr>
<tr><td>Code modular exam:
MMLS-FUND-EXAM</td><td>Competence indicators</td><td>Knowledge indicators</td><td>In the theoretical exam, these competence and knowledge criteria are translated into the following assessment criteria:</td></tr>
<tr><td>Name modular exam:
Exam

Type:
Written test of theoretical concepts and applications of the body of knowledge and skills

Number of examiners:
2 for construction and evaluation of test and answer model, 1 for assessment, 2nd in case of doubt

Assessment:
Grade

Cut-off value:
55%

Minimal result:
5.5

Weighting:
100%

Period and resit:
2 chances per study year;</td><td>Competence indicators
1.1. (intermediate level): Designs experiments based on the required quality and quantity of the product or result.
→ In the exam, the student can design experiments based on a research question.
1.2. (intermediate level): Applies strict logical thinking to draw conclusions from the results:
- in the context of the experiments
- in comparison to other analyses, reference/theoretical values, and quality requirements.</td><td>Knowledge criteria - Application of techniques in this exam implies the design of experiments or interpretation of data
• Has knowledge and understanding of the principle of all standard techniques to detect DNA (such as Southern Blot, PCR, FISH, (next generation) sequencing), RNA (such as Northern blot, RT-PCR, expression array, RNAseq, in situ hybridization) and proteins (such as SDS-PAGE, Western blot, immunocytochemistry, immunohistochemistry, protein array, mass spec) and can apply the appropriate technique to answer a question about the presence, quantity, alteration/modification or localization of DNA, RNA or protein
• understands how gene expression is regulated in prokaryotes and eukaryotes and applies this knowledge to heterologous gene expression
• is able to design a strategy for gene cloning and heterologous expression
• has knowledge and understanding of the mechanisms of gene silencing by siRNA and is able to apply siRNA to</td><td>→ In the exam, the student explains and applies the body of knowledge and skills to design and analyse experiments and data and explains and interprets the theoretical background, aims, methods, results, conclusion and discussion of a current scientific article. The article is provided at the beginning of the exam.</td></tr>
</table>

Chance1: December 2019 Chance 2: January 2020 ***Compensation:*** None		downregulate gene expression • is able to design a (conditional) knock-out strategy • is able to explain the composition and functions of prokaryotic and eukaryotic cells, function of organelles, cell cycle regulation, DNA repair, signal transduction, protein modification and localization • has knowledge and understanding of the principle of techniques to analyze cell proliferation, cell cycle, apoptosis, protein modification and can apply these techniques to answer question on such cellular functions • has knowledge and understanding of the properties of proteins, nucleic acids (DNA, RNA), sugars, lipids, endotoxin, salt, viruses and bacteria • has knowledge and understanding of biomolecule purification methods (such as size exclusion chromatography, ion exchange, hydrophobic interaction, ultrafiltration, affinity chromatography, precipitation, filtration, drying) and is able to choose a purification method depending on the composition of the original sample and the biomolecule to be purified • has knowledge and understanding of methods to analyse biomolecules (such as NMR, chromatography, enzyme assays, ultrafiltration, absorption measurement, selective breakdown, enzyme immune-assay) and is able to choose an analytical method based on the biomolecule(s) to be analyzed • has knowledge and understanding of metabolic pathways, cell chemistry and biosynthesis and can apply this knowledge to optimize metabolite production (metabolic engineering) • is able to set up an enzyme activity	

		tests Statistics • understands the meaning of: statistical hypotheses, type of variable (continuous / categorical), association versus causation, confounding variables, variation, normal distribution, population versus sample, dependent and independent observations, Type I and Type II error, descriptive statistics, the relationship between central tendency (mean, median) and variance, p-value and statistical significance, log-transformation, one- or two-sided tests, multiple testing problems and its solutions • is able to translate the research question into an appropriate statistical question, experimental setup and corresponding statistical analysis • has awareness of power and sample size calculations • Is able to choose the appropriate statistical method for data Analysis, including t-test, ANOVA, multiple regression, chi square tests • is able to report the results with tables and graphics Data Mining • The student is familiar with biological databases Databases (such as Uniprot, Genbank, PDBe, PFAM, PROSITE, CDD, PubMed, KEGG.EBI, EMBL, NCBI) Sequence annotation (DNA and protein sequences) • The student is able to formulate a data strategy to answer a biological question. Sequence annotation (DNA and protein sequences) • Is able to use the principles of transcription, mRNA processing,	

		translation, post-translational modifications and protein structure/domains to evaluate sequence annotation. • Is able to perform BLAST-searches and analyse the results in a correct way.	

General information	
Name of unit of study	Drug development
Code for unit of study	HMP-MMLS-DRD
Teaching period	December 2019 – May 2020
ECTS credits	9
Study load in hours	252
Study hours (contact hours)	55 (lectures, workshops and (computer) trainings), 49 (contact and online studying at University of Florida)
Entry requirements for unit of study (in categories)	- Successful completion of the exam of the unit of study Fundamentals (2 credit points acquired) - All assessments of this unit of study have to be sufficient.
Content and organisation	
General description	During this unit of study, students acquire knowledge in the principle of pharmaceutical chemistry and skills in different stages of drug development by designing strategies in drug discovery, development and delivery. The assignments are placed in the context of cancer drug development. Students acquire knowledge and understanding of the diverse molecular and cellular processes involved in cancer development and the multiple strategies to fight the disease. Industry professionals talk about current R&D in the field of fighting cancer. Prognostic tests for treatment outcomes resulting in personal medicine are addressed as well as advanced 'omics technologies used in the field. The data analysis in this unit of study focuses on the analysis of data from high throughput screenings. Understanding drug design and drug properties is necessary to complete a production strategy. Therefore students study in an online environment principles of the pharmaceutical chemistry during this unit of study. Moreover, they will be trained in understanding the analyses methods used to investigate the structure-related properties of different types of drugs.
Exit qualifications	**Competence 2: Designing strategies for applied research and product development** **Competence 3: Design, analysis and control of experiments** Competence 4: Communication Competence 5: Managing projects Competence 6: Advising

Professional task	1. to understand practical, economic, social and/or ecological needs of businesses, market and society that can be anticipated by biotechnology 2. to apply fundamental knowledge in the area of molecular life sciences to find sustainable solutions for these needs
Cohesion	At the end of the module, all students have the knowledge and skills at that enable them to subsequently acquire the knowledge, skills and Competences characteristic for this master in the Production of Biomoecules 1 unit of study.
Mandatory participation	Assessments
Maximum number of participants	-
Compensation options	None
Activities and/or instructional formats	During this unit of study, students will individually work on their assignments (see also assessment). The supporting education programme will help students to work out their assignments and to master the exam, and therefore to achieve their learning goals. <u>Lectures:</u> • Introduction unit of study and Assignments • Molecular mechanisms in cancer development, cancer diagnosis, cancer drugs • Models to study cancer drugs; assays for drug testing • A short overview clinical trials • Lectures on R&D projects by guest lecturers • Registration of drugs • Structure elucidation analyses. <u>Online lectures</u> • Drug action and drug discovery • Drug design principles • Introduction to pharmacokinetics and drug biotransformation • Drug development, production, and regulation • General principles of pharmaceutical chemistry <u>Workshops:</u> • Cancer drugs/cancer drug development • Statistics: multiplicity tests and ANCOVA <u>Trainings:</u> Analysing High-throughput drug screens
Required literature / description of learning material	❖ Reader Drug Development ❖ Supporting High-throughput data analysis and interpretation, and Drug Discovery strategy: ❖ Stratton, M.R. (2011). Exploring the genomes of cancer cells: progress and promise. ❖ Science, 331 (6024), 1553-1558. ❖ Santarius, T. et al. (2010). A census of amplified and overexpressed human cancer genes. Nature Reviews Cancer, 10 (1), 59-64.

	❖ Yates, L.R. & Campbell, P.J. (2012). Evolution of the Cancer Genome. Nat Rev Genet, 13 (11), 795-806. ❖ The Cancer Genome Atlas Network (2012). Comprehensive molecular characterization of human colon and rectal cancer. Nature, 487, 330-337.
Recommended literature	❖ Alberts, Johnson, Lewis, Morgan, Raff, Roberts, and Walter, (2015 or 2017). Molecular Biology of the Cell. (6th or 7th edition). Garland Science. ❖ Lodge, Lund & Minchin (2007): Gene Cloning, Principles and Applications. Tayler & Francis Group ❖ Berg, J.M., Tymoczko, J., Stryer, L. (2015 or 2019). Biochemistry. (8th or 9th edition). W.H. Freeman. ❖ Samuel, M.L., Witmer, J.A., & Schaffner, A. (2011 or 2015). *Statistics for the Life Sciences.* (4th or 5th edition). Pearson. ❖ Agostino, M. (2012). Practical Bioinformatics. (1st edition). Garland Science. ❖ The *International Conference on* Harmonisation of Technical Requirements for Registration of Pharmaceuticals for Human Use (2000) SAFETY PHARMACOLOGY STUDIES FOR HUMAN PHARMACEUTICALS S7A ❖ The *International Conference on Harmonisation* of Technical Requirements for Registration of Pharmaceuticals for Human Use (2005) THE NON-CLINICAL EVALUATION OF THE POTENTIAL FOR DELAYED VENTRICULAR REPOLARIZATION (QT INTERVAL PROLONGATION) BY HUMAN PHARMACEUTICALS S7B ❖ Original Research articles relevant to the assignments ***The reading lists are updated regularly. Therefore, the actual reading list for the unit of study might deviate from the list presented above.***
Required software / required materials	Computer and internet connection
Extra contributions (EER 2.7)	-
Examination	
Name and code [exams or modular exams]	*See exams of the UOS Introduction below this table*
Assessment criteria	*See exams of the UOS Introduction below this table*
Exam and modular exam format(s)	*See exams of the UOS Introduction below this table*
Weight factor of modular exam	*See exams of the UOS Introduction below this table*
Minimum result	5.5
Exam opportunities	*See exams of the UOS Introduction below this table*
Number of examiners for individual exam type	2 for construction and evaluation of test and answer model, 1 for assessment, 2nd in case of doubt
Permitted resources	Calculator

Discussion and review	Within 10 working days after the results of an exam or modular exam, the examiner organises a group discussion, unless there is clearly no need for this among the students. After the group discussion or if there was no group discussion, you as an interested party are entitled to review and discuss your own work with your lecturer and the examiner, unless you could reasonably have already done this during the group discussion. You are allowed to review and discuss everything: the assessed exam or modular exam, the questions, assignments and marking system.

Exam of the UOS Drug Discovery and Development

	Assessment criteria/ Indicators / requirements		
	Competence indicators	***Body of Knowledge and Skills***	***Assessment criteria***
Code modular exam: MMLS-DRD-FPhC	*Competence indicators*	*Knowledge indicators*	*These competence and knowledge criteria are translated into the following assessment criteria**
Name modular exam: Fundamentals in Pharmaceutical Chemistry ***Type:*** Online knowledge test ***Number of examiners:*** 1 for construction and evaluation of test (UoF) and answer model, 1 for assessment (UoF), HAN assessor verifies. ***Assessment:*** Grade; Conversion of grades from University of Florida (US): US HAN E 0 D 5.5 C 6	2.1. Is able to independently acquire knowledge in a new subject by consulting specific literature and other resources; is able to identify reliable and suitable sources; Discriminates between major and side issues 2.2. Combines information from different sources in the context of the own project 2.3. Defines the project aim in terms of products and/or results based on the acquired background information 2.4. Defines the quality requirements for products and processes based on legal requirements. 2.5. Designs different approaches that could lead to the project aim. Evaluates these possibilities and justifies the choice based on scientific arguments and practical	• understands the principles of pharmacology, pharmacokinetics & drug-biotransformation, and pharmacodynamics • knows and understands drug design principles • knows and understands the principle of different types of drugs and treatment approaches (such as small molecules, antibodies, gene therapy, antibiotics and anti-virals, chemotherapy, radiotherapy), their advantages and disadvantages. • is able to choose one type of drug as active pharmaceutical ingredient depending on desired biological effect • is able to choose a delivery system based on desired selectivity and bio-availability • knows that structure-analysis can be used to predict the function of the biomolecule and to discover interaction partners/ drugs • knows the different phases of clinical studies • is able to define quality requirement for products and processes based on regulatory guidelines • is aware of the requirements for	Written assay module assignment and timed quizzes are applied to assess the following criteria: <u>Drug Action and Drug Discovery</u> - Understand the sources for new lead structures - Describe the LADME process - Define the terms pharmacokinetics and pharmacodynamics - Evaluate a structure in terms of physicochemical properties - Be able to calculate the logP using the π value equation - Apply Lipinski's rule of five and the degree of ionization to predict the behavior of a substance in solution - Define the terms acid and base <u>Drug Design Principles</u> - Understand the terms ED50, therapeutic index, certain safety factor, log-dose response curve, and Lineweaver-Burke plot - Relate the principle of a pharmacophore to structure activity relationship, functional group substitutions, and stereochemistry - Analyze a structure according to electronic and steric effects

B- 6,5 B+ 7 A- 7.5 A+ (90.0-92.5%) 8 A+ (92.5-95.0%) 8.5 A+(95.0-97.5%) 9 A+(97.5-99.9%) 9.5 ***Cut-off value:*** 55% ***Minimal result:*** 5.5 ***Weighting:*** 20% ***Period and resit:*** 2 chances per study year; Chance 1: April 2019 Chance 2: in agreement with University of Florida and student ***Compensation:*** None	parameters such as time, costs, quality and personnel	entering the clinical phase, and for market entry	- Present a basic understanding of quantitative structure-activity relationship (QSAR) principles - Combine their knowledge of lessons 1 and 2 to synthesize and analyze a drug structure <u>Introduction to Pharmacokinetics & Drug Biotransformation</u> - Understand and be able to explain the pharmacokinetic terms half-life, volume of distribution, first-order kinetics, zero-order kinetics, linear and non-linear kinetics, area under the curve (AUC), one- and multi-compartment models - Describe the differences between drug administration and pharmacokinetic behavior following enteral and parenteral routes - Distinguish between one-compartment and multicompartment pharmacokinetic models - Explain the functions of biotransformation and the impact it has on bioavailability and activity of a drug Apply the concepts of phase I and phase II metabolism - Predict the potential routes of metabolism for a drug based on structure and knowledge of the various metabolic enzymes involved in phase I and phase II metabolism <u>Drug Development, Production, and Regulation</u> - Describe the past and current legislation regulating drug products in the US - Explain the stages of drug development - Distinguish between preclinical and clinical drug testing and its purposes - Differentiate between the regulatory authority of the FDA for marketed drug

			products - Understand the basics of patent protection for a drug product <u>Comprehensive HyLighter assignment</u> - Apply knowledge learned throughout the course to the development of a new drug entity - Transfer knowledge and research information specific to a drug used in therapy For details see the Syllabus PHA6432 Fundamentals of Pharmaceutical Chemistry of the University of Florida.

Code modular exam: MMLS-DRD-SEA **Name:** Structure Elucidation Analysis ***Type:*** Written Product ***Number of examiners:*** 2 for construction and evaluation of test and answer model, 2 for assessment. ***Assessment:*** Grade ***Cut-off value:*** 55% ***Minimal result:*** 5.5 ***Weighting:*** 40% ***Period and resit:*** 2 chances per study year; Chance1: April 2020 Chance 2: June 2020 ***Compensation:*** None	2.1 Is able to independently acquire knowledge in a new subject by consulting specific literature and other resources; is able to identify reliable and suitable sources; Discriminates between major and side issues 2.2. Combines information from different sources in the context of the own project.	• Familiar with the analytical procedures of IR, MS, and NMR and understand the theory of how each technique. • Understand the differences and specific advantages and disadvantages of each analytical technique introduced in this course.	Written assay module assignment to assess the following criteria: - General Principles of structure elucidation - Advantages and disadvantages of each technique - Principles of IR radiation. - Beer-Lambert law - Advantages and disadvantages of IR for structure identification - Important functional groups in IR analysis - Principles of mass spectrometry - Different modes of fragmentation and detection - Ionization techniques - MS and separation techniques - Interpret a mass spectrum generated by different ionization methods - Limitations of mass spectrometry - Specific applications of mass spectrometry for structure elucidation in Forensics and the pharmaceutical industry - Basic principles of NMR spectroscopy. - Chemical shifts - Spectra of crystalline organic solids and it's interpretation - Tying together the data from the different techniques to make an accurate structural determination. - Understanding what constitutes "good enough" in structure elucidation for different audiences

	Competence indicators	***Knowledge indicators***	***For this assignment, these indicators and knowledge criteria are translated into the following assessment criteria****
Code modular exam: MMLS-DRD-PRES ***Name modular exam:*** Poster Presentation on Drug Discovery Strategy ***Type:*** Group product ***Number of examiners:*** 2 for assessment ***Assessment:*** Insufficient/Sufficient ***Cut-off value:*** 55% ***Minimal result:*** Sufficient ***Weighting:*** - ***Period and resit:*** 2 chances per study year; Chance1: April 2020 Chance 2: May 2020 ***Compensation:*** none	2.1. Is able to independently acquire knowledge in a new subject by consulting specific literature and other resources; is able to identify reliable and suitable sources; Discriminates between major and side issues; 2.2. Combines information from different sources in the context of the own project 2.3. Defines the project aim in terms of products and/or results based on the acquired background information 3.1. Designs experiments based on the required quality and quantity of the product or result. 4.2. Presents project plans and results in English to colleagues, other researchers in the field or to clients. The poster presentation is at a level equivalent to a presentation at an international symposium 6.5. Gives advice about choosing new equipment or methods based on project goals, overall goals and available resources	• explains the principle of all standard techniques to detect DNA (such as Southern Blot, PCR, FISH, (next generation) sequencing), RNA (such as Northern blot, RT-PCR, expression array, RNAseq, in situ hybridization) and proteins (such as SDS-PAGE, Western blot, immunocytochemistry, immunohistochemistry, protein array, mass spec) and can apply the appropriate technique to answer a question about the presence, quantity or localization of DNA, RNA or protein • has knowledge and understanding of prokaryotic and eukaryotic cells, function of organelles, cell cycle regulation, DNA repair, signal transduction, protein modification and localization • understands the principle of techniques to analyze cell proliferation, cell cycle, apoptosis, protein modification and can apply these techniques to answer question on such cellular functions • has knowledge and understanding of the molecular mechanisms that contribute to cancer development and can apply this knowledge for the design of cancer diagnostics and anti-cancer drugs • understands the principles of pharmacology, pharmacokinetics & drug-biotransformation, and pharmacodynamics • knows and understands drug design principles • knows and understands the principle of different types of drugs and treatment	- At least 10 recent (majority published within the last 5 years) peer-reviewed research articles relevant to the subject are referenced to. This is shown by a reference list included in the presentation. Content *Introduction* - Describes the impact of the syndrome and the presently available treatments. *Design* - A valid argumentation supported by the literature is given for choosing this strategy of solution to improve the drug's efficacy, bio-availability, specificity or production strategy. *Assay* - The screening methodology to test/identify is correct and justified (measuring efficacy, bio-availability, specificity, toxic effect or delivery) Poster Presentation: - Figures and tables are clearly/correctly labelled. - Audience is on the whole informed. - Is intelligible. - Uses mostly appropriate vocabulary when talking about familiar topics.

		approaches (such as small molecules, antibodies, gene therapy, chemotherapy, radiotherapy, immunotherapy), their advantages and disadvantages • is able to choose one type of drug as an active pharmaceutical ingredient depending on the desired biological effect • is able to choose a delivery system based on desired selectivity and bio-availability. • is able to design a strategy to measure the bio-availability of the drug. • can explain methods to analyze biomolecules (such as NMR, chromatography, enzyme assays, ultrafiltration, absorption measurement, selective breakdown, enzyme immune-assay) and is able to choose an analytical method based on the biomolecule(s) to be analyzed • is able to design appropriate *in vitro* and *in vivo* assays to test the efficacy, selectivity and the toxicology of a drug • knows which animal models can be used to test drugs, and the advantages and disadvantages of these models • understands the meaning of: statistical hypotheses, type of variable (continuous / categorical), association versus causation, confounding variables, variation, normal distribution, population versus sample, dependent and independent observations, Type I and Type II error, descriptive statistics, the relationship between central tendency (mean, median) and variance, p-value and statistical significance, log-transformation, one- or two-sided tests, multiple testing problems and its solutions • Is able to choose the appropriate	

		statistical method for data Analysis, including t-test, ANOVA, multiple regression, chi square tests • is able to report the results with tables and graphics	
Code modular exam: MMLS-DRD-HTDA	***Competence indicators***	***Knowledge indicators***	***For this assignment, these indicators and knowledge criteria are translated into the following assessment criteria****
Name modular exam: High-throughput data analysis ***Type:*** Individual written professional product ***Number of examiners:*** 2 for construction and evaluation of assignment and assessment form, 2 for assessment ***Assessment:*** Grade ***Cut-off value:*** 55% ***Minimal result:*** 5.5 ***Weighting:*** 40% ***Period and resit:*** 2 chances per study year;	**1.1.** Is able to independently acquire knowledge in a new subject by consulting specific literature and other resources; is able to identify reliable and suitable sources; Discriminates between major and side issues **1.2.** Combines information from different sources in the context of the own project **1.5** Designs different approaches that could lead to the project aim. Evaluates these possibilities and justifies the choice based on scientific arguments and practical parameters such as time, costs, quality and personnel 3.2. Applies strict logical thinking to draw conclusions from the results and interprets them: - in the context of the experiments - in the context of the project aim (helicopter view) - in comparison to other analyses, reference/theoretical values, and quality requirements.	• Understands the principle and application of statistical hypothesis, hypothesis test, one- or two-tailed test, p-value, adjustment for multiple testing Data Mining • The student is familiar with biological databases Databases (such as Uniprot, Genbank, PDBe, PFAM, PROSITE, CDD, PubMed, KEGG.EBI, EMBL, NCBI) Sequence annotation (DNA and protein sequences) • The student is able to formulate a data strategy to answer a biological question. High-throughput data analysis • understands the principle steps in analyzing high-throughput data obtained by –omics approaches. • has analyzed and interpreted a limited number of high-throughput data and is able to communicate to specialists about such analyses	• is able to define relevant features for genes/proteins that might serve as drug targets (applies appropriate filtering, de-multiplexing). • can decide which data could be relevant and how or where this kind of data could be obtained. (use quality control and find reference databases). • has devised an effective workflow to analyse and interpret the data.(applies the correct steps to compare the data). • has analysed relevant data using the appropriate statistics and/or reasoning. • is able to identify relevant information in the public domain and able to connect the analysis results to that information. (appropriate use of genome browsers, pathway databases and reference databases). • use the information at hand properly to draw conclusions and provide useful advice. (draw meaningful conclusions about the biological interpretation)

Chance1: February 2020 Chance 2: April 2020 ***Compensation:*** none	4.1. (intermediate level) Reports project plans and results according to the standard format of scientific documents and the reader recognizes the scientific international conventions criteria		

**** Note: Adjustments in the <u>exact description</u> of the assessment criteria can be made based on experiences with previous students groups with the aim to improve relevance, reliability and transparency of the assessment***

General information	
Name of unit of study	**Production of Biomolecules 1**
Code for unit of study	HMP-MMLS-POB1
Teaching period	May-July 2020
ECTS credits	5
Study load in hours	140
Study hours (contact hours)	24
Entry requirements for unit of study	• Successful completion of the exam of the unit of study Fundamentals (8 credit points acquired) • All assessments of this unit of study have to be sufficient.
Content and organisation	
General description	Central to this unit of study is the development of a strategy to increase the microbial oil production by yeast. To this end, bio-informatics skills will be applied by students to annotate genes and to identify gene products in yeast which might be involved in microbial oil production. Based on this, students suggest a metabolic engineering strategy to manipulate the cells in such a way that production of microbial oil can be increased. Growing cells on biobased materials is considered in the strategy as well.
Exit qualifications	**Competence 2: Designing strategies for applied research and product development** **Competence 3: Design, analysis and control of experiments** Competence 4: Communication Competence 5: Managing projects Competence 6: Advising
Professional task	1. to understand practical, economic, social and/or ecological needs of businesses, market and society that can be anticipated by biotechnology 2. to apply fundamental knowledge in the area of molecular life sciences to find sustainable solutions for these needs
Cohesion	At the end of the module, all students have the knowledge and skills at that enable them to subsequently acquire the knowledge, skills and Competences characteristic for this master in the Production of Biomoecules 2 unit of study.
Mandatory participation	Assessments
Maximum number of participants	-
Compensation options	None
Activities and/or instructional formats	During this unit of study, students individually work on their different assignments.

	The supporting education programme will help students to work out their assignments and to master the exam, and therefore to achieve their learning goals. <u>Lectures</u> - Introduction Unit of Study - Introduction biotechnology - Microbial oil production in yeast - Metabolic engineering <u>Workshop/Trainings</u> - Bio-informatics: study databases for genes and metabolic pathways/ verify gene annotation
Required literature / description of learning material	Students will get access to the HAN BioCentre literature database as background literature for their assignments, especially assignment 6.1.
Recommended literature	❖ Alberts, Johnson, Lewis, Raff, Roberts, and Walter, (2015 or 2017). *Molecular Biology of the Cell*. (6th or 7th edition). Garland Science: ❖ Lodge, Lund & Minchin (2007): *Gene Cloning, Principles and Applications.* Tayler & Francis Group: ❖ Samuel, M.L., Witmer, J.A., & Schaffner, A. (2011 or 2015). *Statistics for the Life Sciences.* (4th or 5th edition). Pearson. ❖ Agostino, M. (2012). Practical Bio-informatics. Garland Science. ❖ <u>Original research articles</u> related to the assignments Further literature can be found in the PubMed database and journals on biotechnology/ microbiology, respectively, and might be provided with the specific assignments. To access full-text articles, students can make use of the online facilities of the HAN. ***The reading lists are updated regularly. Therefore, the actual reading list of this unit of study might deviate from the list presented above.***
Required software / required materials	Computer and Internet connection
Extra contributions (EER 2.7)	-
Examination	
Name and code [exams or modular exams]	MMLS-POB1-MICRO

Assessment criteria	- At least 10 recent (majority published within the last 5 years) peer-reviewed research articles relevant to the subject are referenced to.
	
	<u>Content:</u>
	- The student describes the background and research aim, convincing the audience that achieving the aim is of added value to science and society.
	- The student describes the cellular pathway(s) generally occurring in yeast and that are relevant to answer the research question.
	- The relationship between the pathway and the research aim is made clear.
	- The students identified and verified which of the above described pathways and involved genes do exist in the HBC strain by
	  - gene searches by searching the HBC database with known genes of other strains, and
	  - verification of the identified genes by blasting the HBC gene against other sequences and
	  - multiple alignments
	- Explains these pathways / genes in relation to the research aim.
	- The student verified the annotation of the genes and gene products (discussed above) in HBC by multiple sequence alignments with correct conclusions.
	- The student explains a genetic engineering strategy that will probably lead to increased PMO production. The strategy is supported by convincing scientific arguments based on the pathways explained.
	- The student outlines the genetic engineering strategy by showing the experimental steps (e.g. PCR, transfection) involved in a flowchart, including experiments demonstrating that:
	  - Genetic engineering was successful on the genome level
	  - Genetic engineering was successful on the level of the functional gene product
	  - PMO production is increased
	
	Presentation, minimum level:
	- The presentation stays within the given time limit (+/- 5 mins). Slides are clear with only occasional spelling and grammar mistakes. Figures and tables are clearly/correctly labelled.
	- The presentation has an introduction-body-conclusion structure and is easy to understand.
	- Is intelligible. Intonation is generally appropriate.
	- Uses appropriate vocabulary to give and exchange views, on familiar topics
	- Produces extended stretches of language despite some hesitation..
	
	<u>Presentation, excellent level:</u>
	- Slides are visually interesting. Uses correct

	spelling and grammar. Figures and tables are easy to understand. - All content is relevant to the task. Audience is fully informed. - The presentation tells a cohesive story: it is exceptionally well-organised and easy to understand and follow. - Natural posture, Gestures and movements that enhance the verbal and visual message. - Is intelligible. Intonation is appropriate. - Uses a wide range of grammatical forms and appropriate vocabulary to give and exchange views on familiar and unfamiliar topics - Natural and spontaneous: Produces extended stretches of language with ease and very little hesitation. Contributions are relevant, coherent and varied. <u>Answering questions</u> - The student can further explain and defend the chosen strategy using arguments that are scientifically correct and based on efficiently achieving the project aim The student stuck to the set deadline for giving the presentation
Exam and modular exam format(s)	Presentation in pairs of 2 students
Weight factor of modular exam	100%
Minimum result	5.5
Exam opportunities	2 chances per study year; Chance1: June 2020 Chance 2: July 2020
Number of examiners for individual exam type	2 for construction and evaluation of assignment and assessment form, 2 for assessment
Permitted resources	-
Discussion and review	Within 10 working days after the results of an exam or modular exam, the examiner organises a group discussion, unless there is clearly no need for this among the students. After the group discussion or if there was no group discussion, you as an interested party are entitled to review and discuss your own work with your lecturer and the examiner, unless you could reasonably have already done this during the group discussion. You are allowed to review and discuss everything: the assessed exam or modular exam, the questions, assignments and marking system.

Code modular exam: MMLS-POB1-MICRO	***Competence indicators***	***Knowledge indicators***	***For this assignment, these indicators and knowledge criteria are translated into the following assessment criteria****

Name modular exam: Presentation on research strategy to optimize microbial oil production in yeast
 	
Type: Presentation in pairs of 2 students
 	
Number of examiners: 2 for construction and evaluation of assignment and assessment form, 2 for assessment
 	
Assessment: Grade
 	
Cut-off value: 55%
 	
Minimal result: 5.5
 	
Weighting: 100%
 	
Period and resit: 2 chances per study year;
Chance1: June 2020
Chance 2: July 2020
	2.1 Is able to independently acquire knowledge in a new subject by consulting specific literature and other resources; is able to identify reliable and suitable sources; Discriminates between major and side issues;
	2.2. Combines information from different sources in the context of the own project
	→ In this gene discovery strategy, the student demonstrates that he/she acquired knowledge about yeast morphology and metabolism, about metabolic pathways that contribute to microbial oil production, and about annotating genes and gene function, and combines this knowledge to describe a strategy to enhance microbial oil production from yeast.
	2.3 Defines the project aim in terms of products and/or results based on the acquired background information
	2.5 Designs different approaches that
		• has knowledge and understanding of metabolic pathways, cell chemistry and biosynthesis and can apply this knowledge to optimize metabolite production (metabolic engineering)
		• The student is able to explain the composition and functions of prokaryotic and eukaryotic cells, function of organelles, cell cycle regulation, DNA repair, signal transduction, protein modification and localization
		• explains the principle of all standard techniques to detect DNA (such as Southern Blot, PCR, FISH, (next generation) sequencing), RNA (such as Northern blot, RT-PCR, expression array, RNAseq, in situ hybridization) and proteins (such as SDS-PAGE, Western blot, immunocytochemistry, immune-histochemistry, protein array, mass spec) and can apply the appropriate technique to answer a question about the presence, quantity or localization of DNA, RNA or protein
		• is able to design a strategy for gene cloning and heterologous expression
		• is able to design a (conditional) knock-out strategy
		• understands how gene expression is regulated in prokaryotes and eukaryotes and applies this knowledge to heterologous gene expression
		Data Mining
			- At least 10 recent (majority published within the last 5 years) peer-reviewed research articles relevant to the subject are referenced to.
			
			<u>Content:</u>
			- The student describes the background and research aim, convincing the audience that achieving the aim is of added value to science and society.
			- The student describes the cellular pathway(s) generally occurring in yeast and that are relevant to answer the research question.
			- The relationship between the pathway and the research aim is made clear.
			- The students identified and verified which of the above described pathways and involved genes do exist in the HBC strain by
			  - gene searches by searching the HBC database with known genes of other strains, and
			  - verification of the identified genes by blasting the HBC gene against other sequences and
			  - multiple alignments
			- Explains these pathways / genes in relation to the research aim.
			- The student verified the annotation of the genes and gene products (discussed above) in HBC by multiple

Compensation: none	could lead to the project aim. Evaluates these possibilities and justifies the choice based on scientific arguments and practical parameters such as time, costs, quality and personnel 2.6 Designs a complete strategy leading to the project aim (project of about 3-4 months; see also: managing projects) 3.1. Designs experiments based on the required quality and quantity of the product or result 4.2. Presents project plans and results in English to colleagues, other researchers in the field or to clients. The presentation is at a level equivalent to a presentation at an international symposium 6.5 Gives advice about choosing new equipment or methods based on project goals, overall goals and available resources	• The student is familiar with biological databases Databases (such as Uniprot, Genbank, PDBe, PFAM, PROSITE, CDD, PubMed, KEGG.EBI, EMBL, NCBI) Sequence annotation (DNA and protein sequences) • The student is able to formulate a data strategy to answer a biological question. Sequence annotation (DNA and protein sequences) • Is able to use the principles of transcription, mRNA processing, translation, post-translational modifications and protein structure/domains to evaluate sequence annotation. • Is able to perform BLAST-searches and analyse the results in a correct way. Sequence alignments and score matrices • Knows the features of a qualitatively good alignment. • Is able to illustrate the use of (multiple) sequence alignments. • Is able to evaluate the evolution of sequences	sequence alignments with correct conclusions. - The student explains a genetic engineering strategy that will probably lead to increased PMO production. The strategy is supported by convincing scientific arguments based on the pathways explained. - The student outlines the genetic engineering strategy by showing the experimental steps (e.g. PCR, transfection) involved in a flowchart, including experiments demonstrating that: - Genetic engineering was successful on the genome level - Genetic engineering was successful on the level of the functional gene product - PMO production is increased Presentation, minimum level: - The presentation stays within the given time limit (+/- 5 mins). Slides are clear with only occasional spelling and grammar mistakes. Figures and tables are clearly/correctly labelled. - The presentation has an introduction-body- conclusion structure and is easy to understand.

			- Is intelligible. Intonation is generally appropriate. - Uses appropriate vocabulary to give and exchange views, on familiar topics - Produces extended stretches of language despite some hesitation.. <u>Presentation, excellent level:</u> - Slides are visually interesting. Uses correct spelling and grammar. Figures and tables are easy to understand. - All content is relevant to the task. Audience is fully informed. - The presentation tells a cohesive story: it is exceptionally well-organised and easy to understand and follow. - Natural posture, Gestures and movements that enhance the verbal and visual message. - Is intelligible. Intonation is appropriate. - Uses a wide range of grammatical forms and appropriate vocabulary to give and exchange views on familiar and unfamiliar topics - Natural and spontaneous: Produces extended stretches of language with ease and very little hesitation. Contributions are relevant, coherent and varied. <u>Answering questions</u> - The student can further explain and defend the chosen strategy using arguments that are scientifically correct and based on efficiently achieving the project aim - The student stuck to the set deadline for giving the presentation

**** Note: Adjustments in the <u>exact description</u> of the assessment criteria can be made based on experiences with previous students groups with the aim to improve relevance, reliability and transparency of the assessment.***

General information	
Name of unit of study	Production of Biomolecules 2
Code for unit of study	HMP-MMLS-POB2
Teaching period	August - September 2019
ECTS credits	4
Study load in hours	112
Study hours (contact hours)	18
Entry requirements for unit of study	• Successful completion of the exam of the unit of study Fundamentals (8 credit points acquired) • All assessments of this unit of study have to be sufficient.
Content and organisation	
General description	In the unit of study Production of Biomolecules 2 students will continue their studies of part 1 by setting up a planning and quotation for the heterologous production of a protein. Students apply their knowledge of various production strains, upstream processing, downstream processing and cost calculations. Furthermore, students will become familiar with product development for pharmaceutical purposes and the principles behind Quality by Design. The guidelines of working according to Good Manufacturing Practice (GMP) standards and the consequences thereof are also subject of this unit of study. This unit of study is completed with a theoretical exam about part 1 and part 2 of the Production of Biomolecules module.
Exit qualifications	**Competence 2: Designing strategies for applied research and product development** **Competence 3: Design, analysis and control of experiments** Competence 4: Communication Competence 5: Managing projects Competence 6: Advising
Professional task	1. to understand practical, economic, social and/or ecological needs of businesses, market and society that can be anticipated by biotechnology 2. to apply fundamental knowledge in the area of molecular life sciences to find sustainable solutions for these needs
Cohesion	At the end of the module, all students have the knowledge and skills at that enable them to subsequently acquire the knowledge, skills and Competences characteristic for this master in the Vaccines and Diagnostics unit of study.
Mandatory participation	Assessments
Maximum number of participants	-
Compensation options	None

Activities and/or instructional formats	During this unit of study, students individually work on their different assignments. The supporting education programme will help students to work out their assignments and to master the exam, and therefore to achieve their learning goals. <u>Lectures</u> - Introduction Unit of Study - Microbial oil production in yeast - Metabolic engineering - Biologicals for pharmaceutical use: Quality by Design <u>Workshop/Trainings</u> - Bio-informatics: study databases for genes and metabolic pathways/ verify gene annotation - Good Manufacturing Practice (GMP)
Required literature / description of learning material	<u>Compulsory:</u> ❖ Quality by Design: - Bioproduction Group (2012). Quality by Design in Biomanufacturing. White paper. Available from: www.bio-g.com/ - FDA (2011). Guidance for industry: process validation: general principles and practices. ❖ GMP: - ICH (2000). Good Manufacturing Practice Guide for Active Pharmaceutical Ingredients Q7. - Allport-Settle, M.J. (2009). Good Manufacturing Practice (GMP) Guidelines: The Rules Governing Medicinal Products in the European Union, EudraLex Volume 4 Concise Reference. Available from: http://ec.europa.eu/health/documents/eudralex/vol-4/index_en.htm Students will get access to the HAN BioCentre literature database as background literature for their assignments, especially assignment 6.1. <u>Recommended:</u> ❖ Alberts, Johnson, Lewis, Raff, Roberts, and Walter, (2015 or 2017). *Molecular Biology of the Cell*. (6th or 7th Edition). Garland Science: ❖ Lodge, Lund & Minchin (2007): *Gene Cloning, Principles and Applications.* Tayler & Francis Group: ❖ Samuel, M.L., Witmer, J.A., & Schaffner, A. (2011 or 2015). *Statistics for the Life Sciences.* (4th or 5th edition). Pearson. ❖ Agostino, M. (2012). Practical Bio-informatics. Garland Science. ❖ Original research articles related to the assignments

	Further literature can be found in the PubMed database and journals on biotechnology/ microbiology, respectively, and might be provided with the specific assignments. To access full-text articles, students can make use of the online facilities of the HAN. ***The reading lists are updated regularly. Therefore, the actual reading list of this unit of study might deviate from the list presented above.***
Required software / required materials	Computer and internet connection
Extra contributions (EER 2.7)	-
Examination	
Name and code [exams or modular exams]	*See exams of the Production of Biomolecules 2 below this table*
Assessment criteria	*See exams of the Production of Biomolecules 2 below this table*
Exam and modular exam format(s)	*See exams of the Production of Biomolecules 2 below this table*
Weight factor of modular exam	*See exams of the Production of Biomolecules 2 below this table*
Minimum result	5.5
Exam opportunities	*See exams of the Production of Biomolecules 2 below this table*
Number of examiners for individual exam type	*See exams of the Production of Biomolecules 2 below this table*
Permitted resources	calculator
Discussion and review	Within 10 working days after the results of an exam or modular exam, the examiner organises a group discussion, unless there is clearly no need for this among the students. After the group discussion or if there was no group discussion, you as an interested party are entitled to review and discuss your own work with your lecturer and the examiner, unless you could reasonably have already done this during the group discussion. You are allowed to review and discuss everything: the assessed exam or modular exam, the questions, assignments and marking system.

Exam of the UOS Production of Biomolecules 2

	Assessment criteria/ Indicators / requirements		
	Competence indicators	***Body of Knowledge and Skills***	***Assessment criteria***
Code modular exam: MMLS-POB2-EXAM	*Competence indicators*	*Knowledge indicators*	*In the theoretical exam, these competence and knowledge criteria are translated into the following assessment criteria**
Name modular exam: Theoretical exam ***Type:*** Written test of theoretical concepts and applications ***Number of examiners:*** 2 for construction and evaluation of test and answer model, 1 for assessment, 2nd in case of doubt ***Assessment:*** Grade ***Cut-off value:*** 55% ***Minimal result:*** 5.5 ***Weighting:*** ~~50~~100% ***Period and resit:*** 2 chances per study year; Chance1: September 2019 Chance 2: November 2019	2.6 Defines the quality requirements for products and processes based on legal requirements. 2.1 Designs experiments based on the required quality and quantity of the product or result. 3.2 Applies strict logical thinking to draw conclusions from the results and interprets them: - in the context of the experiments - in the context of the project aim (helicopter view) - in comparison to other analyses, reference/theoretical values, and quality requirements. 6.5. Gives advice about choosing new machines or methods based on project goals and overall goals and availabilities of the organisation	Biochemistry: • has knowledge and understanding of the properties of proteins, nucleic acids (DNA, RNA), sugars, lipids, endotoxin, salt, viruses and bacteria • has knowledge and understanding of biomolecule purification methods (such as exclusion chromatography, ion exchange, hydrophobic interaction, (ultra)filtration, affinity chromatography, precipitation, drying) and is able to choose a purification method depending on the composition of the original sample and the biomolecule to be purified • has knowledge and understanding of methods to analyse biomolecules (such as, chromatography, enzyme assays, ultrafiltration, absorption measurement, selective breakdown, enzyme immune-assay) and is able to choose an analytical method based on the biomolecule(s) to be analysed • has knowledge and understanding of metabolic pathways, cell chemistry and biosynthesis, and can apply this knowledge to optimize metabolite production (metabolic engineering) Cell biology: • is able to explain the composition and	- Is able to design strategies to increase biomolecule production - is able to analyse data generated in the course of biomolecule production - is able to design strategies for heterologous production of biomolecules or analyse data generated from such strategies - is able to design strategies to purify biomolecules or to analyse data from purification experiments - explains industrial applications of enzymes - is able to design strategies or analyse data for process optimization - is able to define quality criteria of products and processes based on provided guidelines - is able to explain technical principles and challenges of the production of biomolecules in a biobased economy

Compensation: None		functions of prokaryotic and eukaryotic cells, function of organelles, cell cycle regulation, DNA repair, signal transduction, protein modification and localization Molecular Biology: • explains the principle of all standard techniques to detect DNA (such as Southern Blot, PCR, FISH, (next generation) sequencing), RNA (such as Northern blot, RT-PCR, expression array, RNAseq, in situ hybridization) and proteins (such as SDS-PAGE, Western blot, immunocytochemistry, immune-histochemistry, protein array, mass spec) and can apply the appropriate technique to answer a question about the presence, quantity or localization of DNA, RNA or protein • is able to design a strategy for gene cloning and heterologous expression • understands how gene expression is regulated in prokaryotes and eukaryotes and applies this knowledge to heterologous gene expression • is able to design a (conditional) knock-out strategy Enzymes: • knows the industrial applications of enzymes Process development and optimization: • knows the advantages and disadvantages of different production strains and is able to choose a suitable production strain for the production of specific proteins • tests critical parameters in the production process (USP and DSP) and interprets the outcome • is able identify critical parameters in the process • is aware of the fact that scaling up or	

		down requires process re-optimization Quality assurance, quality control, regulatory guidelines: • is able to define quality requirement for products and processes based on regulatory guidelines (such as FDA, ICH guidelines) Biobased Economy: • is able to describe a target product profile and criteria l quality attributes • Is able to explain the main principles of a biobased economy and its new technological challenges • Is able to explain the difference between first, second and third generation feedstocks • Is able to describe the steps needed to convert plant biomass into fermentation feedstock • Is able to describe the technological challenges by using biomass as fermentation feedstocks	

Code modular exam: MMLS-POB2-PP	***Competence indicators***	***Knowledge indicators***	***For this assignment, these indicators and knowledge criteria are translated into the following assessment criteria****
Name modular exam: Planning and quotation for small scale protein production ***Type:*** Individual written professional product ***Number of examiners:*** 2 for construction and evaluation of assignment and assessment form, 1-2 for assessment ***Assessment:*** Sufficient - not sufficient ***Minimal result:*** sufficient ***Period and resit:*** 2 chances per study year; Chance1: August 2019 Chance 2: September 2019	2.1 Is able to independently acquire knowledge in a new subject by consulting specific literature and other resources; is able to identify reliable and suitable sources; Discriminates between major and side issues; 2.2 Combines information from different sources in the context of the own project 2.3 Defines the project aim in terms of products and/or results based on the acquired background information 2.5. Designs different approaches that could lead to the project aim. Evaluates these possibilities and justifies the choice based on scientific arguments and practical parameters such as time, costs, quality and personnel 2.6. Designs a complete strategy leading to the project aim (project of about 3-4 months; see also: managing projects) 5.4. Organizes the project in phases and defines decision points/milestones	• understands the mechanisms of regulation of gene expression in pro- and eukaryotic cells and applies this knowledge for heterologous gene expression • is able to design a strategy for gene cloning and heterologous expression • has knowledge and understanding of biomolecule purification methods (such as size exclusion chromatography, ion exchange, hydrophobic interaction, ultrafiltration, affinity chromatography, precipitation, filtration, drying) and is able to choose a purification method depending on the composition of the original sample and the biomolecule to be purified • is able identify critical parameters in the process	The assessment consists of a time schedule and quotation, intended for internal use. <u>Content:</u> - The Project approach in scheme presents the main activities to be performed to obtain the deliverables. It is presented in such a way that the relation between deliverables/milestones and main activities are easy to catch. Milestones / Decision points are shown at crucial moments of the project. - Work Breakdown Structure: main activities are subdivided into activities from which a time planning and dividing responsibilities can be based on. The activities related to the USP and DSP inform which culture conditions and purification approaches, respectively, are worthwhile testing. The activity related to enzyme analysis informs which enzyme analysis method is used. Activities are divided in the phases of 'Initiation and Definition', 'Design and Planning', ' Execution and Control', and 'Project Close Out'. - All activities are numbered. The interdependencies of the different activities are shown by indicating to which previous activity (number) each activity is related. It is shown which activities lead to which derivable / milestone - Work Breakdown Structure: indicates for each activity by which project member it is executed and the number of hours required

	5.7. Describes a times schedule based on the (experimental) plan 5.8. Describes the required budget		- The project activities, deliverables/milestones and decision points are placed into a time frame. The time schedule is presented in a lay-out that makes it easy to catch. - Work Breakdown Structure: each activity is placed into the time frame it is carried out during the project. The time planning matches with the interdependencies of the activities described in the project approach - The sales price for the project is based on: the cost price for the project (see Work Breakdown Structure) and the added value for the customer. The argumentation is provided in the Work Breakdown Structure (see below) - Work Breakdown Structure: The estimated amount of needed working hours for each activity is indicated. If one activity is carried out by more than one project member, the working hours for each of these project members are given. Based on the number of total working hours for each project member and a fictive, but indicated price per hour for each project member, the costs for working hours are calculated and given. The costs for materials are calculated as 5% of the costs for the working hours. An argumentation for the sales price asked is included. This is based on the cost price and the added value for the customer.

**** Note: Adjustments in the exact description of the assessment criteria can be made based on experiences with previous students groups with the aim to improve relevance, reliability and transparency of the assessment.***

Exam of the UOS Production of Biomolecules 2

	Assessment criteria/ Indicators / requirements		
	Competence indicators	***Body of Knowledge and Skills***	***Assessment criteria***
Code modular exam: **MMLS-POB2-EXAM**	*Competence indicators*	*Knowledge indicators*	*In the theoretical exam, these competence and knowledge criteria are translated into the following assessment criteria**
Name modular exam: **Theoretical exam** ***Type:*** Written test of theoretical concepts and applications ***Number of examiners:*** 2 for construction and evaluation of test and answer model, 1 for assessment, 2nd in case of doubt ***Assessment:*** Grade ***Cut-off value:*** 55% ***Minimal result:*** 5.5 ***Weighting:*** 5~~0~~100% ***Period and resit:*** 2 chances per study year;	2.7 Defines the quality requirements for products and processes based on legal requirements. 2.2 Designs experiments based on the required quality and quantity of the product or result. 3.2 Applies strict logical thinking to draw conclusions from the results and interprets them: - in the context of the experiments - in the context of the project aim (helicopter view) - in comparison to other analyses, reference/theoretical values, and quality requirements. 6.5. Gives advice about choosing new machines or methods based on project goals and overall goals and availabilities of the organisation	Biochemistry: • has knowledge and understanding of the properties of proteins, nucleic acids (DNA, RNA), sugars, lipids, endotoxin, salt, viruses and bacteria • has knowledge and understanding of biomolecule purification methods (such as exclusion chromatography, ion exchange, hydrophobic interaction, (ultra)filtration, affinity chromatography, precipitation, drying) and is able to choose a purification method depending on the composition of the original sample and the biomolecule to be purified • has knowledge and understanding of methods to analyse biomolecules (such as, chromatography, enzyme assays, ultrafiltration, absorption	- Is able to design strategies to increase biomolecule production - is able to analyse data generated in the course of biomolecule production - is able to design strategies for heterologous production of biomolecules or analyse data generated from such strategies - is able to design strategies to purify biomolecules or to analyse data from purification experiments - explains industrial applications of enzymes - is able to design strategies or analyse data for process optimization - is able to define quality criteria of products and processes based on provided guidelines - is able to explain technical principles and challenges of the

Chance1: September 2019 Chance 2: November 2019 ***Compensation:*** None		measurement, selective breakdown, enzyme immune-assay) and is able to choose an analytical method based on the biomolecule(s) to be analysed • has knowledge and understanding of metabolic pathways, cell chemistry and biosynthesis, and can apply this knowledge to optimize metabolite production (metabolic engineering) Cell biology: • is able to explain the composition and functions of prokaryotic and eukaryotic cells, function of organelles, cell cycle regulation, DNA repair, signal transduction, protein modification and localization Molecular Biology: • explains the principle of all standard techniques to detect DNA (such as Southern Blot, PCR, FISH, (next generation) sequencing), RNA (such as Northern blot, RT-PCR, expression array, RNAseq, in situ hybridization) and proteins (such as SDS-PAGE, Western blot, immunocytochemistry, immune-histochemistry, protein	production of biomolecules in a biobased economy

		array, mass spec) and can apply the appropriate technique to answer a question about the presence, quantity or localization of DNA, RNA or protein • is able to design a strategy for gene cloning and heterologous expression • understands how gene expression is regulated in prokaryotes and eukaryotes and applies this knowledge to heterologous gene expression • is able to design a (conditional) knock-out strategy Enzymes: • knows the industrial applications of enzymes Process development and optimization: • knows the advantages and disadvantages of different production strains and is able to choose a suitable production strain for the production of specific proteins • tests critical parameters in the production process (USP and DSP) and interprets the outcome • is able identify critical parameters in the process	

		• is aware of the fact that scaling up or down requires process re-optimization Quality assurance, quality control, regulatory guidelines: • is able to define quality requirement for products and processes based on regulatory guidelines (such as FDA, ICH guidelines) Biobased Economy: • is able to describe a target product profile and criteria l quality attributes • Is able to explain the main principles of a biobased economy and its new technological challenges • Is able to explain the difference between first, second and third generation feedstocks • Is able to describe the steps needed to convert plant biomass into fermentation feedstock • Is able to describe the technological challenges by using biomass as fermentation feedstocks	

Code modular exam: **MMLS-POB2-PP**	***Competence indicators***	***Knowledge indicators***	***For this assignment, these indicators and knowledge criteria are translated into the following assessment criteria****
Name modular exam: Planning and quotation for small scale protein production ***Type:*** Individual written professional product ***Number of examiners:*** 2 for construction and evaluation of assignment and assessment form, 1-2 for assessment ***Assessment:*** Sufficient - not sufficient ***Minimal result:*** sufficient ***Period and resit:*** 2 chances per study year; Chance1: August 2019 Chance 2: September 2019	2.1 Is able to independently acquire knowledge in a new subject by consulting specific literature and other resources; is able to identify reliable and suitable sources; Discriminates between major and side issues; 2.2 Combines information from different sources in the context of the own project 2.3 Defines the project aim in terms of products and/or results based on the acquired background information 2.5. Designs different approaches that could lead to the project aim. Evaluates these possibilities and justifies the choice based on scientific arguments and practical parameters such as time, costs, quality and personnel 2.6. Designs a complete strategy leading to the project aim (project of about 3-4 months; see also: managing projects) 5.4. Organizes the project in phases and defines decision points/milestones 5.7. Describes a times schedule based on the (experimental) plan 5.8. Describes the required budget	• understands the mechanisms of regulation of gene expression in pro- and eukaryotic cells and applies this knowledge for heterologous gene expression • is able to design a strategy for gene cloning and heterologous expression • has knowledge and understanding of biomolecule purification methods (such as size exclusion chromatography, ion exchange, hydrophobic interaction, ultrafiltration, affinity chromatography, precipitation, filtration, drying) and is able to choose a purification method depending on the composition of the original sample and the biomolecule to be purified • is able identify critical parameters in the process	The assessment consists of a time schedule and quotation, intended for internal use. <u>Content:</u> - The Project approach in scheme presents the main activities to be performed to obtain the deliverables. It is presented in such a way that the relation between deliverables/milestones and main activities are easy to catch. Milestones / Decision points are shown at crucial moments of the project. - Work Breakdown Structure: main activities are subdivided into activities from which a time planning and dividing responsibilities can be based on. The activities related to the USP and DSP inform which culture conditions and purification approaches, respectively, are worthwhile testing. The activity related to enzyme analysis informs which enzyme analysis method is used. Activities are divided in the phases of ‘Initiation and Definition’, ‘Design and

			Planning', ' Execution and Control', and 'Project Close Out'. - All activities are numbered. The interdependencies of the different activities are shown by indicating to which previous activity (number) each activity is related. It is shown which activities lead to which derivable / milestone - Work Breakdown Structure: indicates for each activity by which project member it is executed and the number of hours required - The project activities, deliverables/milestones and decision points are placed into a time frame. The time schedule is presented in a lay-out that makes it easy to catch. - Work Breakdown Structure: each activity is placed into the time frame it is carried out during the project. The time planning matches with the interdependencies of the activities described in the project approach - The sales price for the project is based on: the cost price for the project (see Work Breakdown

			Structure) and the added value for the customer. The argumentation is provided in the Work Breakdown Structure (see below) - Work Breakdown Structure: The estimated amount of needed working hours for each activity is indicated. If one activity is carried out by more than one project member, the working hours for each of these project members are given. Based on the number of total working hours for each project member and a fictive, but indicated price per hour for each project member, the costs for working hours are calculated and given. The costs for materials are calculated as 5% of the costs for the working hours. An argumentation for the sales price asked is included. This is based on the cost price and the added value for the customer.

**** Note: Adjustments in the exact description of the assessment criteria can be made based on experiences with previous students groups with the aim to improve relevance, reliability and transparency of the assessment.***

General information	
Name of unit of study	Vaccines and Diagnostics
Code for unit of study	HMP-MMLS-VAD
Teaching period	October 2019 – February 2020
ECTS credits	9
Study load in hours	252
Study hours (contact hours)	60
Entry requirements for unit of study	• Successful completion of the exam of the unit of study Fundamentals (8 credit points acquired) • All assessments and assignments of this module have to be sufficient
Content and organisation	
General description	During this unit of study, students acquire knowledge and skills in the area of vaccine discovery and production, and the development and validation of diagnostic test. By writing and proposal on the development of a putative new or improved vaccine, they deepen their knowledge on immunological processes and the interaction between pathogens and hosts. By choosing an improved diagnostic test from the literature, students will acquire knowledge and understanding of different types of diagnostic test, their advantages and limitations in detecting specific pathogens. Students write a validation for the analytical validation of their diagnostic test, thereby integrating quality and project management aspects with their scientific ideas. Statistical aspects of diagnostic tests/ analytical procedures are addressed as well. The competence development of students is focussed on Designing strategies for applied research and product development, Design, analysis and control of experiments, Communication and Advising. By translating the key points of their scientific argumentation into a summary that is understandable and convincing for the financial department, student further develop their professional writing skills.
Exit qualifications	**Competence 2: Designing strategies for applied research and product development** **Competence 3: Design, analysis and control of experiments** **Competence 4: Communication** Competence 5: Managing projects **Competence 6: Advising**
Professional task	1. to understand practical, economic, social and/or ecological needs of businesses, market and society that can be anticipated by biotechnology

	2. to apply fundamental knowledge in the area of molecular life sciences to find sustainable solutions for these needs 3. to implement such solutions in a successful and efficient way by organizing their realization in projects, considering the interdisciplinary dimension and communicating with different experts. Such projects have a duration of at least three months.
Cohesion	At the end of the module, all students have the knowledge and skills at that enable them to subsequently acquire the knowledge, skills and Competences characteristic for this master in the major project unit of study.
Mandatory participation	Assessments
Maximum number of participants	-
Compensation options	None
Activities and/or instructional formats	During this module, students will individually work on their central assignments which are advising on the improvement of vaccines and diagnostic tests (see also assessment). The supporting education programme will help students to work out their assignments and to master the exam, and therefore to achieve their learning goals. <u>Lectures:</u> - Lectures Immunology, Infections and Vaccines - Lecture week Vaccines and Diagnostics - Brainstorm meeting on Diagnostic tests - Interactive lectures: advantages and disadvantages of Diagnostic tests - Guest lectures: Vaccines and Diagnostics - Validation of diagnostic tests - Writing for non-specialists: video lecture <u>Workshops /Trainings:</u> - Statistics for diagnostic tests - Bioinformatics training: Predicting conserved regions
Required literature / description of learning material	<u>Compulsory:</u> ❖ Reader Vaccines and Diagnostics ❖ Reader Scientific Writing ❖ Quality guidelines - The *International Conference on Harmonisation* of Technical Requirements for Registration of Pharmaceuticals for Human Use. (2005). Validation of Analytical Procedures: Text and Methodology Q2(R1). - Food and Drug Administration, Center for Biologics Evaluation and Research (CBER). (2015). Guidance

	for Industry: Analytical Procedures and Methods Validation for Drugs and Biologics. ❖ Specific assignments - Key articles are provided with the specific assignments Further assignment-specific literature can be found in the PubMed database Recommended: Books: ❖ For immunological background: any good immunology study book, such as: o Murphy, K. (2016). Janeway's Immunobiology (9th edition). Garland Science o Belves, P.J., Martin, S.J., Burton, D.R., Roitt, I.M. (2010, 2012 or 2017). Roitt's Essential Immunology. (11th , 12th or 13th Edition). Wiley-Blackwell o Male, D., Brostoff, J., Roth, D.B. & Roitt, I.M. (2012). Immunology (8th edition). Philadelphia: Elsevier o Parts of: Alberts, Johnson, Lewis, Raff, Roberts, and Walter (2011 or 2015). Molecular Biology of the Cell. (6th or 7th Edition). Garland Science. o Wood, P. (2011). Understanding Immunology. (3rd edition). Person Education Limited (advice from previous student to start with in cases of very little background knowledge) => focus on the chapters about innate and adaptive immunity against pathogens, antigen presentation, activation of B and T cells, vaccination and antibody production ❖ Lodge, Lund & Minchin (2007) *Gene Cloning, Principles and Applications.* Tayler & Francis Group; parts of Chapter 13: Medical applications ❖ Tang, Y., Stratton, C.W. (2013 or 2018) *Advanced Techniques in Diagnostic Microbiology* (2nd or 3rd edition). Springer, New York ❖ Samuel, M.L., Witmer, J.A., & Schaffner, A. (2011 or 2015). Statistics for the Life Sciences (4th or 5th edition). Pearson. ❖ Agostino, M. (2012). Practical Bio-informatics. Garland Science. ❖ Glasman-Deal, H. (2009). Science Research Writing for non-native speakers of English. Imperial College Press ❖ Scientific writing: Stevens, M. (2007). Subtleties of Scientific Style. Sciencescape Editing, Australia Regulatory Guidelines:

	❖ Food and Drug Administration. (2018). Guidance for Industry: Bioanalytical Method Validation ❖ European Medicines agency. (2011). Guideline on bioanalytical method validation ❖ Food and Drug Administration. (2007). Guidance for Industry and FDA Staff: Statistical Guidance on Reporting Results from Studies Evaluating Diagnostic Tests Research articles relevant to the assignments: ❖ Further assignment-specific literature can be found in the PubMed database (do not forget to make use of the Journals the HAN has access to) ***The reading lists are updated regularly. Therefore, the actual reading list of the unit of study might deviate from the list presented above.***
Required software / required materials	Computer and internet connection
Extra contributions (EER 2.7)	-
Examination	
Name and code [exams or modular exams]	*See exams of the Vaccines and Diagnostics below this table*
Assessment criteria	*See exams of the Vaccines and Diagnostics below this table*
Exam and modular exam format(s)	*See exams of the Vaccines and Diagnostics below this table*
Weight factor of modular exam	*See exams of the Vaccines and Diagnostics below this table*
Minimum result	5.5
Exam opportunities	*See exams of the Vaccines and Diagnostics below this table*
Number of examiners for individual exam type	*See exams of the Vaccines and Diagnostics below this table*
Permitted resources	calculcator
Discussion and review	Within 10 working days after the results of an exam or modular exam, the examiner organises a group discussion, unless there is clearly no need for this among the students. After the group discussion or if there was no group discussion, you as an interested party are entitled to review and discuss your own work with your lecturer and the examiner, unless you could reasonably have already done this during the group discussion. You are allowed to review and discuss everything: the assessed exam or modular exam, the questions, assignments and marking system.

Exam of the UOS Vaccines and Diagnostics

	Assessment criteria/ Indicators / requirements		
	Competence indicators	***Body of Knowledge and Skills***	***Assessment criteria***
Code modular exam: **MMLS-VAD-VAC DP**	**Competence indicators**	***Knowledge indicators***	***For this assignment, these indicators and knowledge criteria are translated into the following assessment criteria****
Name modular exam: Vaccine development proposal ***Type:*** Individual written professional product ***Number of examiners:*** 2 for construction and evaluation of assignment and assessment form, 2 for assessment ***Assessment:*** Grade ***Cut-off value:*** 55% ***Minimal result:*** 5.5 ***Weighting:*** 50% ***Period and resit:*** 2 chances per study year;	2.1. Is able to independently acquire knowledge in a new subject by consulting specific literature and other resources; is able to identify reliable and suitable sources; Discriminates between major and side issues; 2.2. Combines information from different sources in the context of the own project 2.3. Defines the project aim in terms of products and/or results based on the acquired background information 2.5. Designs different approaches that could lead to the project aim. Evaluates these possibilities and justifies the choice based on scientific arguments and practical parameters such as time, costs, quality and personnel 2.6 Designs a complete strategy leading to the project aim (project of about 3-4 months; see also: managing projects) 3.1 Designs experiments based on the required quality and quantity of the product or result.	• has knowledge and understanding of prokaryotic and eukaryotic cells, function of organelles, cell cycle regulation, DNA repair, signal transduction, protein modification and localization • understand the mechanisms by which micro-organisms can cause disease • has knowledge and understanding of the immune response to pathogens (action of innate and adaptive immune system, induction and effects of cellular and humoral immunity, mechanisms for induction of memory) • knows different types of vaccines (such as attenuated, inactivated, subunit, recombinant, DNA), their mode of action and their advantages and disadvantages	- At least 10 recent (the majority published within the last 5 years) peer-reviewed research articles relevant to the subject are referenced to. - References are given according to international standards. - The proposal follows the prescribed format. <u>Expert summary</u> - The resulting advice is convincingly summarized with reference to the motivation, aim and the key arguments for the presumable success of the vaccine. <u>Motivation</u> - The motivation for the production of an improved vaccine is based on impact of the disease and problems with current vaccination programmes <u>Summary of the literature</u>

Chance 1: December 2019 Chance 2: February2020 student ***Compensation:*** none	3.2 Applies strict logical thinking to draw conclusions from the results and interprets them: - in the context of the experiments - in the context of the project aim (helicopter view) - in comparison to other analyses, reference/theoretical values, and quality requirements 4.1. Reports project plans and results according to the standard format of scientific documents and meets the scientific international conventions criteria. 4.3. Describes the key message of the project relevant for patenting, registration, and/or business development. Uses terminology that is understandable for experts from different departments. 5.7 Describes a schedule based on the (experimental) plan 5.8. Describes the required budget 6.4. Integrates own project results in the multidisciplinary defined goals and advises to other departments 6.5. Gives advice about choosing new equipment or methods based on project goals, overall goals and available resources	• is able to choose a vaccine antigen, adjuvant and administration route depending on the immune response that is required and on practical aspect • knows different vaccine production platforms, their advantages and disadvantages • is able to design experiments to test the potency of a vaccine • knows different types of diagnostic tests, their principle of action and their advantages and disadvantages • understands the principles, advantages and disadvantages of different diagnostic tests, e.g. serology and molecular diagnostics • is able to choose a type of diagnostic test based on the required specificity, sensitivity and practical aspects such as duration, requirement for staff training	- The student explains the molecular and immunological mechanisms by which the pathogen causes disease and concludes about the desired effects of the improved vaccine on the immune system <u>Preliminary results.</u> - The student explains which type of vaccine he/she would further develop by critically discussing the current literature. The effect of the vaccine on the immune system is explicitly addressed. <u>Plan of investigation</u> - The student describes the development of the vaccine including the practical aspects, a time schedule, the production system and how the potency of the is tested. This needs to be justified both scientifically and practical-economically. <u>Diagnostic test</u> - The student selects a molecular diagnostic test based on its advantages and disadvantages that is not commercially available. The student describes this test and gives relevant arguments for his choice.

			Writing (minimal level): - The purpose of the document is clear; Text is generally well organised and coherent (a variety of linking words and cohesive devices are used). - The document is written in correct scientific style: Uses everyday vocabulary and phrases, with occasional inappropriate use. - Simple, mostly correct grammar is used. Errors may be noticeable but the meaning can be determined. Writing (excellent level): - Text is a well-organised, coherent whole. Paragraphs are structured effectively. - Uses a range of appropriate vocabulary and phrases effectively and precisely. Correct grammar is used with flexibility and sophistication. Summary for financial department (weighting about 20%, 55% of points are required for sufficient): - The summary for the financial department contains convincing arguments for financial support including an estimation of the needed investment, based on the

			plan of investigation and the expected win. The summary is well understandable for people with other backgrounds than biotechnology.
Code modular exam: **MMLS-VAD-VAL PL**	***Competence indicators***	***Knowledge indicators***	***For this assignment, these indicators and knowledge criteria are translated into the following assessment criteria****
Name modular exam: **Validation plan for analytical validation of new/improved diagnostic test** ***Type:*** Individual written professional product ***Number of examiners:*** 2 for construction and evaluation of assignment and assessment form, 2 for assessment ***Assessment:*** Grade ***Cut-off value:*** 55% ***Minimal result:*** 5.5	2.1. Is able to independently acquire knowledge in a new subject by consulting specific literature and other resources; is able to identify reliable and suitable sources; Discriminates between major and side issues; 2.2. Combines information from different sources in the context of the own project 2.3. Defines the project aim in terms of products and/or results based on the acquired background information 2.4. Defines the quality requirements for products and processes based on legal requirements. 2.5. Designs different approaches that could lead to the project aim. Evaluates these possibilities and justifies the choice based on scientific arguments and practical parameters such as time, costs, quality and personnel	• explains the principle of all standard techniques to detect DNA (such as Southern Blot, PCR, FISH, (next generation) sequencing), RNA (such as Northern blot, RT-PCR, expression array, RNAseq, in situ hybridization) and proteins (such as SDS-PAGE, Western blot, immunocytochemistry, immunohistochemistry, protein array, mass spec) and can apply the appropriate technique to answer a question about the presence, quantity or localization of DNA, RNA or protein • has knowledge and understanding of methods to analyze biomolecules (such as NMR, chromatography, enzyme assays, ultrafiltration, absorption	<u>Content:</u> - The subject of the validation plan is concisely described. - The choice of the diagnostic test is described based on scientific and practical arguments and is supported with scientific literature - The intended use is concisely described and matches with the assignment. Limitations, when applicable, are defined. - The principle of the method to be used is transparently explained. A figure visualizes the principle. - The testing algorithm is described with respect to tested samples and timeline. - The student describes the theoretical and the practical specificity aimed for.*

Weighting: 50% ***Period and resit:*** 2 chances per study year; Chance1: February 2020 Chance 2: March 2020 ***Compensation:*** none	2.6. Designs a complete strategy leading to the project aim (project of about 3-4 months; see also: managing projects) 3.1. Designs experiments based on the required quality and quantity of the product or result. 4.1. Reports project plans and results according to the standard format of scientific documents and meets the scientific international conventions criteria.	measurement, selective breakdown, enzyme immune-assay) and is able to choose an analytical method based on the biomolecule(s) to be analyzed • has knowledge and understanding of prokaryotic and eukaryotic cells, function of organelles, cell cycle regulation, DNA repair, signal transduction, protein modification and localization • knows different types of diagnostic tests, their principle of action and their advantages and disadvantages • understands the principles, advantages and disadvantages of different diagnostic tests, e.g. serology and molecular diagnostics • is able to define the importance of sensitivity, specificity, and practical aspects such as costs, duration or required trained staff, based on the desired application of the diagnostic test • is able to choose a type of diagnostic test based on the required specificity, sensitivity and practical aspects such as	- The student describes how the theoretical and practical specificity will be determined.* - The student describes the sensitivity (Limit of Detection, Limit of Quantification, Linearity and Range) aimed for.* - The student describes how the sensitivity (Limit of Detection, Limit of Quantification, Linearity and Range) will be determined * - The student describes the accuracy aimed for * - The student describes how the accuracy will be determined * - The student describes the precision (repeatability, intermediate precision and reproducibility) aimed for * - The student describes how the precision (repeatability, intermediate precision and reproducibility) will be determined * - The student describes the robustness aimed for * - The student describes how the robustness will be determined. * - The student describes the interference and inhibition (not) acceptable in the test *

		duration, requirement for staff training • is able to define quality requirement for products and processes based on regulatory guidelines • is able to design a strategy to validate a diagnostic test • is able to determine the accuracy, sensitivity and specificity of a diagnostic test, and to understand ROC curves	- The student describes how the interference and inhibition will be determined * - * three of the six parameters specificity, sensitivity, accuracy, precision, robustness and interference and inhibition are discussed in each validation plan. <u>Writing:</u> - The validation plan and work plan follow the prescribed format. References are given according to international standards. Writing (minimal level): - The purpose of the document is clear; Text is generally well organised and coherent (a variety of linking words and cohesive devices are used). - The document is written in correct scientific style: Uses everyday vocabulary and phrases, with occasional inappropriate use. - Simple, mostly correct grammar is used. Errors may be noticeable but the meaning can be determined. Writing (excellent level):

			- Text is a well-organised, coherent whole. Paragraphs are structured effectively. - Uses a range of appropriate vocabulary and phrases effectively and precisely. Correct grammar is used with flexibility and sophistication.

**** Note: Adjustments in the exact description of the assessment criteria can be made based on experiences with previous students groups with the aim to improve relevance, reliability and transparency of the assessment.***

General information	
Name of unit of study	Research and Product Development Skills 1
Code for unit of study	HMP-MMLS-RD1
Teaching period	September 2019 – August 2020
ECTS credits	23
Study load in hours	644
Study hours (contact hours)	55 hours at HAN and 589 contact hours learning on the (placement) workplace of which 280 hours related to professional products and 309 hours related to professional performance development
Entry requirements for unit of study	All assessments of this unit of study have to be sufficient.
Content and organisation	
General description	This unit of study focuses on the skills necessary for research and product development in various stages of product development pipelines in bioscience. Students become aware of the different stages of the product development pipelines in bio business and will develop the necessary Research and Product Development skills required to run projects within this pipeline. Research skills trained in this unit of study comprise finding and interpreting relevant literature, experimental excellence, data analysis and interpretation, and Design of Experiments. In addition, students are trained in scientific writing, presenting and discussions, and advising about the own or similar projects in an interdisciplinary context. Students perform this unit of study in the context of their (placement) workplace. The product, a Scientific progress report, and the Design of Experiments are preferentially produced by students using their very own professional environment. This competences Designing strategies for applied research and product development, Design, analysis and control of experiments and Communication are the focus in this unit of study.
Exit qualifications	Competence 1: Professional conduct and guiding professional development **Competence 2: Designing strategies for applied research and product development** **Competence 3: Design, analysis and control of experiments** **Competence 4: Communication** Competence 5: Managing projects Competence 6: Advising

Professional task	1. to understand practical, economic, social and/or ecological needs of businesses, market and society that can be anticipated by biotechnology 2. to apply fundamental knowledge in the area of molecular life sciences to find sustainable solutions for these needs
Cohesion	At the end of the module, all students have the knowledge and skills at that enable them to subsequently acquire the knowledge, skills and Competences characteristic for this master in the Reseach and product Development skills 2 unit of study. These competences addressed in this unit of study are integrally applied with competences in Managing Projects, which are trained during the unit of study Managing Projects 1 that runs in parallel to this unit of study
Mandatory participation	The participation in the placement according to the placement contract is compulsory for students enrolled in the full-time programme.
Maximum number of participants	The maximum number of participants is defined by the number of (placements) workplaces for the full-time programme. The number of participants taking part in this unit of study as part-time or modular student is unlimited.
Compensation options	Students with work experience prior to the study programme can demonstrate that the already acquired the intermediate competence level by handing in a portfolio at the start of the unit of study. After demonstration of this intermediate level, they are exempted from the respective study activities.
Activities and/or instructional formats	During this unit of study, students individually learn on their (internship) workplace by contributing to project work and working on their different assignments. The supporting education programme will help students to work out their assignments and to develop to the required level in practice, and therefore to achieve their learning goals. <u>Lectures</u> - Introduction into the product development pipelines <u>Workshop/Trainings</u> - Research skills and Project Development Skills (e.g. Journal clubs, analysing scientific literature, market surveys) - Design of Experiment DOE/Statistics - Scientific writing - Presenting skills - Feedback sessions

Required literature / description of learning material	Compulsory: ❖ Reader Research and Product Development Skills ❖ Scientific literature related to the (placement) workplace projects and provided during the unit of study ❖ Quality Guidelines of the ICH ❖ Scientific writing guide (provided online) Recommended: ❖ Glasman-Deal; H. (2009). *Science Research* Writing for Non-Native Speakers of English. Imperial College Press ❖ Stevens, M. (2007). Subtleties of Scientific Style. Sciencescape Editing, Australia ***The reading lists are updated regularly. Therefore, the actual reading list of the unit of study might deviate from the list presented above.***
Required software / required materials	Computer and Internet connection SPSS Statistics
Extra contributions (EER 2.7)	-
Examination	
Name and code [exams or modular exams]	*See exams of the Research and Product Development Skills 1 below this table*
Assessment criteria	*See exams of the Research and Product Development Skills 1 below this table*
Exam and modular exam format(s)	*See exams of the Research and Product Development Skills 1 below this table*
Weight factor of modular exam	*See exams of the Research and Product Development Skills 1 below this table*
Minimum result	5.5
Exam opportunities	*See exams of the Research and Product Development Skills 1 below this table*
Number of examiners for individual exam type	*See exams of the Research and Product Development Skills 1 below this table*
Permitted resources	calculator
Discussion and review	Within 10 working days after the results of an exam or modular exam, the examiner organises a group discussion, unless there is clearly no need for this among the students. After the group discussion or if there was no group discussion, you as an interested party are entitled to review and discuss your own work with your lecturer and the examiner, unless you could reasonably have already done this during the group discussion. You are allowed to review and discuss everything: the assessed exam or modular exam, the questions, assignments and marking system.

Exam of the UOS Research and Product Development Skills 1

	Assessment criteria/ Indicators / requirements		
	Competence indicators	***Body of Knowledge and Skills***	***Assessment criteria***
Code modular exam: **MMLS-RD1-*SD***	*Competence indicators*	*Knowledge indicators*	*assessment criteria**
Name modular exam: **Scientific document** ***Type:*** Individual written professional product ***Number of examiners:*** 2 for construction and evaluation of criteria, 1-2 for assessment considering advice of workplace supervisor ***Assessment:*** Sufficient/ insufficient ***Cut-off value:*** - ***Minimal result:*** sufficient ***Weighting:*** 0% ***Period and resit:*** 2 chances per study year;	4.1. (intermediate level): Reports project plans and results according to the standard format of scientific documents and the reader recognizes the scientific international conventions criteria.	*Depending on context of (internship) workplace*	***Content:*** - Communicate straightforward Science concepts/ideas that are discussed in the context of scientific literature. Irrelevances may be present. *(minimum level)* - Communicate straightforward Science concepts/ideas that are discussed in the context of scientific literature. Minor irrelevances may be present. *(above minimum level)* - Communicate straightforward Science concepts/ideas that are discussed in the context of scientific literature. No irrelevances present. *(excellent level)*

Chance1: November 2019 (ft); September 2019-July 2020 (pt) Chance 2: January 2020 (ft); in agreement with student (pt) ***Compensation:*** None			***Organisation:*** - Text is connected and coherent (limited use of linking words and cohesive devices). *(minimum level)* - Holds the target reader's attention most of the time: - Text is generally well organised and coherent (a variety of linking words and cohesive devices are used). *(above minimum level)* - Holds the target reader's attention throughout the document: Text is well organised and coherent. Paragraphs and a variety of linking words and cohesive devices are used) to generally good effect. *(excellent level)* ***Language:*** - Uses everyday vocabulary and phrases, with occasional inappropriate use. - Simple, mostly correct grammar is used. Errors may be noticeable but the meaning can be determined. *(minimum level)*

			- Uses a range of everyday vocabulary and phrases, with occasional inappropriate use. - Correct grammar is used most of the time to convey intended meaning. Errors do not impede communication *(above minimum level)* - Uses a range of vocabulary and phrases, appropriately. Correct grammar is used with control and flexibility to convey intended meaning. Only occasional errors at most, but communication is not impeded *(excellent level)*
Code modular exam: **MMLS-RD1-P**	***Competence indicators***	***Knowledge indicators***	***For this assignment, these indicators and knowledge criteria are translated into the following assessment criteria****
Name modular exam: R&D Presentation ***Type:*** Individual presentation ***Number of examiners:*** 2 for construction and evaluation of criteria, 1 for assessment considering advice of workplace supervisor ***Assessment:*** Sufficient / insufficient	4.2. (intermediate level): Presents experimental data and results in English to colleagues.	*Depending on context of (internship) workplace*	- The presentation stays in the given time limit (15-20 min; no more than 5 mins more or less than the given range) - Slides (or other suitable visual aids) are sometimes unclear. There are occasional spelling and grammar mistakes. Figures and tables are labelled. - Communicate straightforward Science concepts/ideas that are discussed in the context of

Cut-off value: -			scientific literature. Irrelevances may be present. - The presentation has an introduction-body- conclusion structure. - Stiff or no movement in posture and gestures - Is mostly intelligible. - Produces responses which are extended beyond short phrases, despite hesitation. - Shows a good degree of control of simple grammatical forms. Uses mostly appropriate vocabulary when talking about familiar topics. (minimal level) - Slides (or other suitable visual aids) are clear. There are occasional spelling and grammar mistakes. Figures and tables are clearly/correctly labelled. - Communicate straightforward Science concepts/ideas that are discussed in the context of scientific literature. Minor irrelevances may be present. - The presentation has an introduction-body- conclusion structure and is easy to understand.
Minimal result: sufficient			
Weighting: 0%			
Period and resit: 2 chances per study year; Chance1: January 2020 (ft); September 2019-July 2020 (pt) Chance 2: February 2020 (ft), in agreement with student (pt)			
Compensation: none			

			- Some, but not all characteristics of column to the right. Is intelligible. Intonation is generally appropriate. Sentence and word stress is generally accurately placed. - Produces extended stretches of language despite some hesitation. - Uses simple grammatical forms, attempts complex grammatical forms. Uses appropriate vocabulary to give and exchange views, on familiar topics (above minimum level) - Slides (or other suitable visual aids) are clear and visually interesting. Uses correct spelling and grammar. Figures and tables are clearly/correctly labelled and easy to understand. - Communicate straightforward Science concepts/ideas that are discussed in the context of scientific literature. No irrelevances may be present. - The presentation is exceptionally well-organised and easy to understand and follow. It is structured in such way that tells a cohesive story

			- Natural posture, Gestures and movements that enhance the verbal and visual message. - Is intelligible. Intonation is appropriate. Sentence and word stress is accurately placed. - Natural and spontaneous: Produces extended stretches of language with very little hesitation. - Uses a range of simple and some complex grammatical forms. - Uses a range of appropriate vocabulary to give and exchange views on familiar and unfamiliar topics (Excellent level)
Code modular exam: **MMLS-RD1- RP1**	***Competence indicators***	***Knowledge indicators***	***Assessment criteria***
Name modular exam: **Research performance 1** ***Type:*** Performance assessment ***Number of examiners:*** 2 for construction and evaluation of criteria,	Intermediate Level (insufficient/ sufficient) 1.1. (intermediate level): Is able to independently acquire knowledge in a new subject by consulting specific literature 1.2. (intermediate level): Combines information from different sources in the context of the own experiment	*Depending on context of (internship) workplace*	- Quickly gains familiarity with the subject by reading field-specific literature, at least in parts on own initiative. - Takes the initiative to understand and become familiar with the subject. Consults supervisors, colleagues, literature and asks suitable questions.

1-2 for assessment considering advice of workplace supervisor ***Assessment:*** Sufficient/insufficient ***Cut-off value:*** All criteria sufficient ***Minimal result:*** sufficient ***Weighting:*** 0% ***Period and resit:*** 2 chances per study year; Chance1: June/August 2020 (ft), September 2019 – September 2020 (pt) Chance 2: November 2020 (ft), in agreement with student (pt) ***Compensation:*** none	1.3. (intermediate level): Designs different approaches that could lead to the experimental results. Evaluates these possibilities and justifies the choice based on arguments and practical parameters. 3.1. (intermediate level): Designs experiments based on a requested intermediate product. 1.2. (intermediate level): Applies strict logical thinking to draw conclusions from the results: - in the context of the experiments - in comparison to other analyses, reference/theoretical values, and quality requirements. 3.3. (intermediate level): Solves practical problems if experiments do not work as planned (trouble shooting); consults colleagues if necessary. 1.1. (intermediate level): Describes a schedule for a set of necessary experiments. 1.11. (intermediate level): Works efficiently towards a set of defined deliverables. 1.12. (intermediate level): Is in control of the experiments. 1.13. (intermediate level): Is flexible with changing circumstances by adapting the experimental strategy 1.2. (intermediate level):		- Establishes the relationship between the experiments to be carried out and the underlying research question (of the own research) and has a helicopter view. - The student discussed experimental approaches that can lead to the intermediate results or products. - The choices he/she had made were based on scientific and/or practical arguments. - The student designed experiments that will lead to the requested intermediate product or result. - Uses the correct controls in the experiments. Independently selects controls. - Prepares for the experiments well and quickly. Makes few errors in the preparation phase that benefits the speed of the work. - Makes conclusions from the analysed data about the (sub-)aim related to the experiment and does this in the context of the overarching project (helicopter view) and

	Actively participates in a discussion about related projects by asking critical questions. 1.3. (intermediate level): Advises about follow-up projects of the own experiments. 1.4. (intermediate level): Gives advice about choosing new equipment.		- compares with other analyses, reference values or theoretical values from the literature. - Deals with problems if the experiment does not run as was anticipated in a structured manner, is flexible, pro-active, recognises limits. - Generates independently realistic schedule for a set of experiments covering minimally 4 weeks. - Works systematically according to a plan, manages the practical activities efficiently, - Masters new techniques - Works on several experiments at the same time. Can switch easily between the experiments, while keeping an overview. - Works efficiently, quantity of the data is according to the experimental plan. - Knows during the execution of the experiment what he/she is doing at all times, is critical on its own actions and is able to justify his/her own actions. - Performs experiments in such a way that reliable reproducible data is obtained.

			- Works efficiently, quality of the data is high (trusted by peers). - Adjusts the experiment during implementation if necessary and justifies modifications to the study. - The student ask questions during work discussions. - Is able to make realistic proposals for follow-up experiments - And - Is able to design new experiments in response to a research question. - The student chose suitable methods and equipment materials based on practical aspects.
Code modular exam: **MMLS-RD1-DoE**	***Competence indicators***	***Knowledge indicators***	***For this assignment, these indicators and knowledge criteria are translated into the following assessment criteria****
Name modular exam: Design of experiments ***Type:*** Group activity and individual written professional product ***Number of examiners:***	3.1. Designs experiments based on the required quality and quantity of the product or result. 3.2. Applies strict logical thinking to draw conclusions from the results and interprets them: - in view of the experiments	• understands the basics of design of experiments (DoE) methodology, including: design of experiments, randomization, blocking by nuisance factor, factorial design, screening design, comparative designs, optimization design, one-factor at	- The student describes the aim of his/her experimental design. - The student can explain the readout (way to analyse) used in the experiments. - The student describes which parameters will be tested.

2 for construction and evaluation of criteria, 2 for assessment considering advice of workplace supervisor ***Assessment:*** sufficient/insufficient ***Cut-off value:*** sufficient ***Minimal result:*** sufficient ***Weighting:*** 0% ***Period and resit:*** 2 chances per study year; Chance 1: February 2020 Chance 2: March 2020 (ft), in agreement with student (pt) ***Compensation:*** none	- in view of the project aim (helicopter view) - in comparison to other analyses, reference/theoretical values, and quality requirements. 5.1 Defines project deliverables based on the needed quality and quantity 5.2 Identifies project risks based on the (experimental) approach and on (putative) competitors	a time Is able to report the results with tables and graphics • is able to design and analyze a screening and / or process optimization experiment using experimental design • is able to report the results with tables and graphics	He/she can explain his/her choice with scientific insights and relevant literature in a transparent way. - The student describes which parameters (see above) might influence each other's effect on the readout. He/she can explain his/her arguments with scientific insights and relevant literature in a transparent way. - The student can explain the choice of his/her design, including the range of the parameters, based on scientific insights and relevant literature. - The student describes the correct statistical method to analyse the data. - The student describes the risks of the approach.
Code modular exam: **MMLS-RD1-PR** ***Name modular exam:*** **Scientific Progress report**	3.2 Applies strict logical thinking to draw conclusions from the results and interprets them: - in the context of the experiments	*Depending on context of (internship) workplace*	'Pass'-level: - The report follows the format: summary, introduction, materials and methods, results, discussion and conclusion, reference list.

Type: Individual written professional product ***Number of examiners:*** 2 for construction and evaluation of criteria, 2 for assessment considering advice of workplace supervisor ***Assessment:*** Grade ***Cut-off value:*** 55% ***Minimal result:*** 5.5 ***Weighting:*** 100% ***Period and resit:*** 2 chances per study year; Chance1: August 2020 (ft), August 2020 – August 2021 (pt) Chance 2: October 2020 (ft), in agreement with student	- in the context of the project aim (helicopter view) - in comparison to other analyses, reference/theoretical values, and quality requirements. 3.3 Solves practical problems if experiments do not work as planned (trouble shooting); couples back to the theory or consults colleagues if necessary; suggests alternative experiments. 4.1. (intermediate level): Reports project plans and results according to the standard format of scientific documents and the reader recognizes the scientific international conventions criteria.		- The methods are described in a way that they can be repeated by others. - The information presented in the introduction describes the background information relevant to research. - Irrelevant information is present and/or relevant information is partly missing. - The student informs the reader on the result. Relevant information is partly missing. - Figures are described according to scientific conventions. - Discussion: The student discussed the results meaningfully in the light of the experimental procedure, the project aim and the literature. Relevant follow-up experiments are suggested. - Relevant information is partly missing. - The purpose of the document is clear; Text is connected and coherent (limited use of linking words and cohesive devices).

Compensation: none			- The document is written in correct scientific style: Uses everyday vocabulary and phrases, with occasional inappropriate use. - Simple, mostly correct grammar is used. Errors may be noticeable but the meaning can be determined. 'Good' –level: - The information presented in the introduction describes the background information relevant to research. A minimum of Irrelevant information is present. - The student fully informs the reader on the result. Figures are described according to scientific conventions. - The student discussed the results comprehensively in the light of the experimental procedure, the project aim and the literature. The relevance and/or added value of the results to the project aim are convincingly discussed. - A comprehensive set of relevant follow-up experiments is described.

			- Holds the target reader's attention most of the time: Text is generally well organised and coherent - Uses a range of vocabulary and phrases, appropriately. Correct grammar is used with control and flexibility to convey intended meaning. Only occasional errors at most, but communication is not impeded. 'Excellent'-level: - The information presented in the introduction describes the background information relevant to research. The information is of excellent clarity and fully informs the reader. - The student described the results in a transparent and convincing manner. - Figures are described according to scientific conventions. - ('good'-level).. and the results are put in the context of recent developments in the field. - A comprehensive set of relevant follow-up experiments and projects are described. - Holds the target reader's attention throughout the

			document: Text is very well organised and coherent. - Uses a range of vocabulary and phrases, appropriately. Correct grammar is used with control and flexibility to convey intended meaning.

**** Note: Adjustments in the <u>exact description</u> of the assessment criteria can be made based on experiences with previous students groups with the aim to improve relevance, reliability and transparency of the assessment.***

General information	
Name of unit of study	Research and Product Development Skills 2
Code for unit of study	HMP-MMLS-RD2
Teaching period	September 2019 – February 2020
ECTS credits	10
Study load in hours	280
Study hours (contact hours)	25 contact hours at HAN and 255 contact hours learning on the (placement) workplace of which 130 hours related to professional products and 125 hours related to professional performance development
Entry requirements for unit of study (in categories)	• Successful completion of the modular exams of the modular exams “Research Performance 1 of the unit of study Research and Product Development Skills 1 is entry requirement for the assessment of “Research Performance 2” of this unit of study • All assessments of this unit of study have to be sufficient.
Content and organisation	
General description	This unit of study is a follow-up of the unit of study Research and Product Development Skills 1. It again focuses on the skills necessary for research and product development in various stages of product development pipelines in bioscience. Students become aware of the different stages of the product development pipelines in bio business and will develop the necessary Research and Product Development skills required to run projects within this pipeline. Research skills trained in this unit of study comprise finding and interpreting relevant literature, experimental excellence, data analysis and interpretation. Product development skills of this unit of study comprise interpreting relevant quality guidelines and develop a business plan/case. In addition, students are trained in scientific writing, presenting and discussions, and advising about the own or similar projects in an interdisciplinary context. Students perform this unit of study in the context of their (placement) workplace. Their studies on quality guidelines and business development are preferentially related to their own professional environment. This competences Designing strategies for applied research and product development, Design, analysis and control of experiments and Communication are the focus in this unit of study. These competences are integrally applied with competences in Managing Projects, which are trained during the unit of study Managing Projects 2 that runs in parallel to this unit of study.

Exit qualifications	Competence 1: Professional conduct and guiding professional development **Competence 2: Designing strategies for applied research and product development** **Competence 3: Design, analysis and control of experiments** **Competence 4: Communication** Competence 5: Managing projects Competence 6: Advising
Professional task	1. to understand practical, economic, social and/or ecological needs of businesses, market and society that can be anticipated by biotechnology 2. to apply fundamental knowledge in the area of molecular life sciences to find sustainable solutions for these needs
Cohesion	At the end of the module, all students have the knowledge and skills at that enable them to subsequently acquire the knowledge, skills and Competences characteristic for this master in the Major Project unit of study.
Mandatory participation	The participation in the placement according to the placement contract is compulsory for students enrolled in the full-time programme.
Maximum number of participants	The maximum number of participants is defined by the number of (placements) workplaces for the full-time programme. The number of participants taking part in this unit of study as part-time or modular student is unlimited.
Compensation options	None
Activities and/or instructional formats	During this unit of study, students individually learn on their (placement) workplace by contributing to project work and working on their different assignments. The supporting education programme will help students to work out their assignments and to develop to the required level in practice, and therefore to achieve their learning goals. Lectures - Overview Quality guidelines - Business development and writing business plans Workshop/Trainings - Research skills and Project Development Skills (e.g. Journal clubs, analysing scientific literature, market surveys) - Scientific writing - Interpreting quality guidelines - Patent searches & summarizing patent claims (given by an expert from the Dutch Patent Office) - Feedback sessions

Required literature / description of learning material	Compulsory: ❖ Reader Research and Product Development Skills ❖ Scientific literature related to the (placement) workplace projects and provided during the unit of study ❖ Quality Guidelines of the ICH ❖ Scientific writing guide (provided online) Recommended: ❖ Glasman-Deal; H. (2009). *Science Research* Writing for Non-Native Speakers of English. Imperial College Press ❖ Stevens, M. (2007). Subtleties of Scientific Style. Sciencescape Editing, Australia ***The reading lists are updated regularly. Therefore, the actual reading list of* the unit of study *might deviate from the list presented above.***
Required software / required materials	Computer and internet connection
Extra contributions (EER 2.7)	-
Examination	
Name and code [exams or modular exams]	*See exams of the Research and Development Skills 2 below this table*
Assessment criteria	*See exams of the Research and Development Skills 2 below this table*
Exam and modular exam format(s)	*See exams of the Research and Development Skills 2 below this table*
Weight factor of modular exam	*See exams of the Research and Development Skills 2 below this table*
Minimum result	5.5
Exam opportunities	*See exams of the Research and Development Skills 2 below this table*
Number of examiners for individual exam type	*See exams of the Research and Development Skills 2 below this table*
Permitted resources	calculator
Discussion and review	Within 10 working days after the results of an exam or modular exam, the examiner organises a group discussion, unless there is clearly no need for this among the students. After the group discussion or if there was no group discussion, you as an interested party are entitled to review and discuss your own work with your lecturer and the examiner, unless you could reasonably have already done this during the group discussion. You are allowed to review and discuss everything: the assessed exam or modular exam, the questions, assignments and marking system.

Exam of the UOS Research and Development Skills 2

	Assessment criteria/ Indicators / requirements		
Code modular exam: **MMLS-RD2- RP2**	***Competence indicators***	***Knowledge indicators***	***Assessment criteria***
Name modular exam: **Research performance 2**	1.1. Is able to independently acquire knowledge in a new subject by consulting specific literature and other resources; is able to identify reliable and suitable sources; Discriminates between major and side issues 1.2. Combines information from different sources in the context of the own project 2.5. Designs different approaches that could lead to the project aim. Evaluates these possibilities and justifies the choice based on scientific arguments and practical parameters such as time, costs, quality and personnel. 1.1. Designs experiments based on the required quality and quantity of the product or result. 1.2. Applies strict logical thinking to draw conclusions from the results and interprets them: - in the context of the experiments - in the context of the project aim (helicopter view)		Novice level: - The student searched and asked for relevant information about the subject. - The student combined relevant information in the context of the agreed aims. - The student discussed different experimental strategies prior to and during the project. - The choices he/she has made were based on scientific and/or practical arguments. - The student independently designed experiments that will partly lead to the desired product or result. - The student draws valid conclusions from the experiments. Additional help from experts (e.g. statistician) is requested when needed. - The student was able to solve experimental challenges with supervision.
Type: Performance assessment			
Number of examiners: 2 for construction and evaluation of criteria, 1-2 for assessment considering advice of workplace supervisor			
Assessment: Grade			
Cut-off value: 55%			
Minimal result: 5.5			
Weighting: 60%			
Period and resit: 2 chances per study year; Chance1: January/February 2020			

(ft), January/February 2020- August 2021 (pt) Chance 2: March 2020 (ft); in agreement with student (pt) ***Compensation:*** none	- in comparison to other analyses, reference/theoretical values, and quality requirements. 3.3. Solves practical problems if experiments do not work as planned (trouble shooting); couples back to the theory or consults colleagues if necessary; suggests alternative experiments. 5.11. Sets priorities and works efficiently towards the defined project aim/deliverables 5.12. Is in control of the project during all phases by being pro-active if the project does not run according to the plans and initiating an alternative strategy 5.13. Is flexible with changing circumstances by adapting the experimental, project and/or communication strategy 5.14. Obtains the deliverables in time and with the described resources; if not, reasons and justifies the decisions that have been taken in the course of the project 6.1. Actively involves different specialist to collect advise contributing to the progress of the project. 6.2. Actively participates in a discussion about related projects by asking critical		- Generates a realistic schedule for a set of multiple experiments covering minimally 8 weeks. - The student used many of his/her days efficiently in view of the project. He/she prioritized properly with supervision. - The student monitors project development and showed an active resolving attitude. - When prompted: In response to changing circumstances, the student adapted to the situation by changing the experimental or project strategy. - The student obtained most of the deliverables, though exceeding time and/or described resources; if not, reasons and lessons learned are justified. - When prompted: involves different specialists to collect advise with the aim to improve the progress of the project. - When prompted, the student ask questions and makes suggestions for related projects. - The student suggests follow-up experiments/projects that can be performed to answer relevant follow-up questions.

	questions and suggesting follow-up experiments. 6.3. Advises about follow-up projects of the own project. 6.5. Gives advice about choosing new equipment or methods based on project goals, overall goals and available resources		- The student chooses suitable methods and/or equipment based on experimental/project aims and available resources. 'Intermediate' level: - The student searched and asked for relevant information about the subject. The student collected relevant information. - The student combined relevant information to push the project forward in the context of the agreed aims. - The student discussed different experimental strategies prior to and during the project. - The choices he/she has made were based on scientific and/or practical arguments and were deemed feasible to execute. - The student independently designed experiments that will lead to the desired product or result. - The student draws valid conclusions from the experiments and valued those in the achievement of the project aim. Additional help from experts (e.g. statistician) is requested when needed.

			- The student was able to independently solve experimental challenges. - Generates a realistic schedule for a set of multiple experiments covering minimally 12 weeks. - The student used many of his/her days efficiently in view of the project. He/she prioritised properly with some supervision. - The student demonstrated a project management approach by taking actions. - When prompted: In response to changing circumstances, the student adapted to the situation by changing the experimental, project and/or communication strategy. - The student obtained most of the deliverables on time and with the described resources; if not, can demonstrate the he/she took adequate actions to obtain the deliverables or changed to adequate alternative strategies. - Involves different specialists to collect advise with the aim to improve the progress of the project.

			- The student ask questions and makes suggestions for related projects - The student suggests relevant follow-up experiments/projects that can be performed to answer relevant follow-up questions. - The student independently chooses suitable methods and/or equipment based on experimental /project aims and available resources. 'Advanced' level: - Often, the student independently acquired the relevant background information. - The student combined relevant information to push the project forward in the context of the agreed aims from a variety of sources. - The student discussed different experimental strategies prior to and during the project. - The choices he/she has made were based on scientific and/or practical arguments and were deemed feasible to execute. Choices were well justified. - The student independently designed experiments that will

			lead to the desired product or result. The experiments were well justified. - The student demonstrated independent thinking when drawing valid conclusions from the results and valued those in the achievement of the project aim. - The student was able to independently solve complex experimental challenges. - Independently generates a realistic schedule for a set of multiple experiments covering minimally 12 weeks. - The student used most of his/her days efficiently in view of the project. Independently, he/she prioritised properly. - The student demonstrated a project management approach by taking actions that contributed to an efficient progress of the project and prevented unnecessary delay. - At most times, the student independently responded to changing circumstances, the student convincingly adapted to the situation by changing the

			experimental, project and/or communication strategy. - The student obtained all of the deliverables, minimally exceeding time and/or described resources; if not, can demonstrate the he/she pro-actively took adequate actions to obtain the deliverables and/or changed to adequate alternative strategies. - Involves different specialists and uses the advice of different specialists to improve the progress of the project. - The contributions of the student were to-the point and significant. - The student suggests highly relevant and creative follow-up experiments/projects that can be performed to answer relevant follow-up questions - The student independently chooses most suitable methods and/or equipment based on experimental/project aims and available resources. 'Expert' level: - At all times, the student independently acquired the relevant background information.

			- The student combined relevant information to push the project forward in the context of the agreed aims from a variety of sources and in a time-efficient way. - The student discussed different experimental strategies prior to and during the project. - The choices he/she has made were based on scientific and/or practical arguments and were deemed feasible to execute. Choices were well justified and highly convincing. - The student independently designed experiments that will lead to the desired product or result. The experiments were well justified and sound. - The student demonstrated independent thinking when drawing valid conclusions from the results, related those to the literature and valued those in the achievement of the project aim. - The student devised innovative solutions to complex experimental challengers. - Independently generates a realistic and very efficient schedule for a set of multiple

			experiments covering minimally 12 weeks. - The student used always his/her days efficiently in view of the project. Independently, he/she always prioritised properly. - The student demonstrated a systematic project management approach by taking actions that contributed to an efficient progress of the project and prevented unnecessary delay. - At all times, the student independently responded to changing circumstances, the student convincingly adapted to the situation by changing the experimental, project and/or communication strategy. - The student obtained all of the deliverables on time and with the described resources; if not, can demonstrate the he/she pro-actively took most adequate actions to obtain the deliverables and/or changed to most adequate alternative strategies. - Pro-actively involves different specialists and thereby maximises the progress of the project.

			- The contributions of the student were to-the point and significantly contributed to the progress of group projects. - The student advices about useful follow-up projects based on the outcome of the project and the broader (multidisciplinary) context of the field. - The student independently chooses most suitable and efficient methods and/or equipment based on experimental/project aims and available resources.
Code modular exam: **MMLS-RD2-Q**	***Competence indicators***	***Knowledge indicators***	***For this assignment, these indicators and knowledge criteria are translated into the following assessment criteria****
Name modular exam: Assignment on quality guidelines ***Type:*** Individual assignment and group discussion ***Number of examiners:*** 2 for construction and evaluation of criteria, 2 for assessment considering advice of workplace supervisor ***Assessment:***	2.4 Defines the quality requirements for products and processes based on legal requirements.	• Is able to define quality requirements for products and processes based on regulatory guidelines • Is able to describe a target product profile and critical quality attributes	- The student describes the (putative) product to be developed/ made. - The student explains quality guidelines and/or documents that are relevant to safeguard the quality requirements of this product? - relevant quality guidelines and/or documents are named - explains the reasons that these guidelines and/or documents are

Grade ***Cut-off value:*** 55% ***Minimal result:*** 5.5 ***Weighting:*** 40% ***Period and resit:*** 2 chances per study year; Chance1: October 2019 (ft), October 2019 – August 2021 (pt) Chance 2: December 2019 (ft), in agreement with student (pt) ***Compensation:*** none			relevant to safeguard the quality requirements of the (putative) product - The student explains the consequences of these guidelines for the development/manufacturing of the product in practice in a transparent way: - Identifies the paragraphs that are applicable to safeguard the quality requirements of the product - Translates the demands described in the paragraphs to a practical approach (e.g. experiments, assays and measurements) to fulfil these demands - Language - The purpose of the document is clear; Text is generally well organised and coherent. - The document is written in correct scientific style; occasional inappropriate use of vocabulary and phrases is accepted. - Simple, mostly correct grammar is used. Errors may be noticeable but the meaning can be determined.

			- Text is a well-organised, coherent whole. Paragraphs are structured effectively. - Uses a range of appropriate vocabulary and phrases effectively and precisely. Correct grammar is used with flexibility and sophistication. - References, including regulatory guidelines are referred to according to the APA-guidelines.
Code modular exam: **MMLS-RD2-BP**	***Competence indicators***	***Knowledge indicators***	***For this assignment, these indicators and knowledge criteria are translated into the following assessment criteria****
Name modular exam: Business plan ***Type:*** Individual document and pitch ***Number of examiners:*** 2 for construction and evaluation of criteria, 2 for assessment considering advice of workplace supervisor ***Assessment:*** sufficient/ insufficient ***Cut-off value:*** - ***Minimal result:*** sufficient	2.1. Is able to independently acquire knowledge in a new subject by consulting specific literature and other resources; is able to identify reliable and suitable sources; Discriminates between major and side issues 2.2. Combines information from different sources in the context of the own project 2.3. Defines the project aim in terms of products and/or results based on the acquired background information 2.4 Defines the quality requirements for products and processes based on legal requirements. 2.5 Designs different approaches that could lead to the project aim. Evaluates these possibilities and justifies the choice	• is able to use patent databases to identify patent blocks • is aware that he/she needs to contact patent experts if he/she is not sure how to interpret patent databases • is aware of the rights derived from intellectual properties and understands which implications these have for the production of generics and biosimilars • understands the meaning of the terms business models and business development, business value and financing	<u>Business plan:</u> - All criteria of the business plan are concisely summarized in 1-2 pages. The summary is understandable for the managerial audience. - The business vision expressing the ambition and direction in which the company wants to develop is described. This vision includes a description of what the company will look like in the future. (maximum of 4 sentences) - The goals in terms of global aims, potential clients, finances, and employees are described.

Weighting: 0% ***Period and resit:*** 2 chances per study year; Chance1: January 2020 (ft), January 2020 - August 2021 (pt) Chance 2: March 2020 (ft), in agreement with student (pt) ***Compensation:*** none	based on scientific arguments and practical parameters such as time, costs, quality and personnel 2.6 Designs a complete strategy leading to the project aim (project of about 3-4 months; see also: managing projects) 2.7 Identifies opportunities to patent products, results and strategies 3.1 Designs experiments based on the required quality and quantity of the product or result. 4.2. Presents project plans and results in English to colleagues, other researchers in the field or to clients. The presentation is at a level equivalent to a presentation at an international symposium 4.3 Describes the key message of the project relevant for patenting, registration, and/or business development. Uses terminology that is understandable for experts from different departments 5.1 Defines project deliverables based on the needed quality and quantity 5.2 Identifies project risks based on the (experimental) approach and on (putative) competitors 5.4. Organizes the project in phases and defines decision points/ milestones 5.7 Describes a schedule based on the (experimental) plan 5.8 Describes the required budget	• is able to translate his/her projects plans in a concise business plan • is able to define quality requirement for products and processes based on regulatory guidelines • is able to describe a target product profile and critical quality attributes	- The uniqueness of the product is described - Patents: The used search terms match with the product properties, production and application strategy, the search codes correspond to the search strategy and valid conclusions are drawn from the found patent database entries with respect to the own strategy are drawn. - The legal business description and strategic alliances are based on the product properties, patent situation and on expertise, technologies and finances available at the company. - Market: The current situation of the market and expected future market development are described, including market size, governmental legislation and opportunities, (socio)economic status, costs of the products). - Competition status: alternatives (different types of drugs) and prediction of competition strategy are described - Finances: Yearly cost and profit table is a realistic presentation of the expected (investment) costs and incoming money

	6.4 Integrates own project results in the multidisciplinary defined goals and advises other departments		- The phases of product development are scheduled and align with legal requirements - Deliverables of each phase are described including quality criteria in line with guidelines - Decision points are given and are based on deliverables/results crucial to the development process **Pitch:** - The student presents key aspects of the business plan to convince the audience in a pitch of 5 minutes <u>Presentation:</u> - The presentation stays within the given time limit (+/- 5 mins). Slides are clear with only occasional spelling and grammar mistakes. Figures and tables are clearly/correctly labelled. - The presentation has an introduction-body- conclusion structure and is easy to understand. - Is intelligible. Intonation is generally appropriate. - Uses appropriate vocabulary to give and exchange views, on familiar topics

			- Produces extended stretches of language despite some hesitation.

**** Note: Adjustments in the <u>exact description</u> of the assessment criteria can be made based on experiences with previous students groups with the aim to improve relevance, reliability and transparency of the assessment.***

General information	
Name of unit of study	Managing Projects 1
Code for unit of study	HMP-MMLS-PRJM1
Teaching period	September 2019 – August 2020
ECTS credits	15
Study load in hours	420
Study hours (contact hours)	60 contact hours and 360 hours learning on the (placement) workplace of which 140 hours related to professional products and 220 related to professional development
Entry requirements for unit of study (in categories)	All assessments of this unit of study have to be sufficient.
Content and organisation	
General description	Focus of this unit of study is the training of the competences Professional conduct and Guiding the Professional Development, and Managing Projects. Students perform this unit of study in the context of their own (placement) workplace, and are supported in their development by various teaching and assessment activities. In the beginning, the unit of study focusses on professional conduct and getting the awareness of challenges when managing projects. A network analysis gives students insights in the network available to them in comparison to the expertise required for their professional tasks and learning goals. Next, students are trained in the project planning including the definition of deliverables and their quality, project stages, milestones, decision points, exclusions, risks and strategies to deal with them, the project organization and communication plan, a time schedule and budget planning. Students acquire knowledge and understanding during the trainings, and apply this in practice on their (placement) workplace. The experiences made in practice are discussed during classes. This unit of study is integrally carried out with the unit of study Research and Product Development Skills which runs in parallel to this unit of study.
Exit qualifications	**Competence 1: Professional conduct and guiding professional development** Competence 3: Design, analysis and control of experiments Competence 4: Communication **Competence 5: Managing projects** Competence 6: Advising

Professional task	1. to understand practical, economic, social and/or ecological needs of businesses, market and society that can be anticipated by biotechnology 3. to implement such solutions in a successful and efficient way by organizing their realization in projects, considering the interdisciplinary dimension and communicating with different experts. Such projects have a duration of at least three months.
Cohesion	At the end of the module, all students have the knowledge and skills at that enable them to subsequently acquire the knowledge, skills and Competences characteristic for this master in Managing Projects 2 unit of study. These competences addressed in this unit of study are integrally applied with competences in Research and Product Development Skills, which are trained during the unit of study Product Development Skills 1 that runs in parallel to this unit of study
Mandatory participation	The participation in the placement according to the placement contract is compulsory for students enrolled in the full-time programme.
Maximum number of participants	The maximum number of participants is defined by the number of (placements) workplaces for the full-time programme. The number of participants taking part in this unit of study as part-time or modular student is unlimited.
Compensation options	Students with work experience prior to the study programme can demonstrate that the already acquired the intermediate competence level by handing in a portfolio at the start of the unit of study. After demonstration of this intermediate level, they are exempted from the respective study activities.
Activities and/or instructional formats	Professional conduct, professional identity and network analysis - Workshops, Intervision/ supervision Planning and control of projects The trainings cover organisational, attitude and communication aspects of managing projects. There will be 10 trainings of about half a day with the following subjects: - Aim, result, exclusions and presentation techniques - Defining Project phases and Work breakdown - Project Organization and communication, organizing project meetings - Risk management, Techniques used in project meetings - Presentation of Project Work Plans - Intervision, supervision

	Trainings are held in an interactive way where the transfer of theory is alternating offered with discussions and exercises.
Required literature / description of learning material	Compulsory: ❖ Reader Project Management ❖ Reader Project Planning and Control Recommended: ❖ Porny, S.E. (2010). *Project Management for Dummies*. (3rd edition). John Wiley and Sons Ltd. ***The reading lists are updated regularly. Therefore, the actual reading list of this unit of study might deviate from the list presented above.***
Required software / required materials	-
Extra contributions (EER 2.7)	-
Examination	
Name and code [exams or modular exams]	*See exams of the UOS Managing Projects 1 below this table*
Assessment criteria	*See exams of the UOS Managing Projects 1 below this table*
Exam and modular exam format(s)	*See exams of the UOS Managing Projects 1 below this table*
Weight factor of modular exam	*See exams of the UOS Managing Projects 1 below this table*
Minimum result	pass
Exam opportunities	*See exams of the UOS Managing Projects 1 below this table*
Number of examiners for individual exam type	*See exams of the UOS Managing Projects 1 below this table*
Permitted resources	-
Discussion and review	Within 10 working days after the results of an exam or modular exam, the examiner organises a group discussion, unless there is clearly no need for this among the students. After the group discussion or if there was no group discussion, you as an interested party are entitled to review and discuss your own work with your lecturer and the examiner, unless you could reasonably have already done this during the group discussion. You are allowed to review and discuss everything: the assessed exam or modular exam, the questions, assignments and marking system.

Exam of the UOS Managing Projects 1

	Assessment criteria/ Indicators / requirements		
	Competence indicators	***Body of Knowledge and Skills***	***Assessment criteria***
Code modular exam: **MMLS-PRJM1 – PC1**	*Competence indicators*	*Knowledge indicators*	*For this assignment, these indicators and knowledge criteria are translated into the following assessment criteria**
Name modular exam: Professional conduct ***Type:*** Individual performance ***Number of examiners:*** 2 for construction and evaluation of criteria, 1-2 for assessment considering advice of workplace supervisor ***Assessment:*** Sufficient / insufficient ***Cut-off value:*** - ***Minimal result:*** sufficient ***Weighting:*** 0% ***Period and resit:*** 2 chances per study year; Chance1: June/ August 2020 (ft), September 2019-august 2021 (pt)	1.1. (intermediate level): Shows a professional, pro-active, curious, touching scientific attitude: adapts quickly, motivates him/herself, shows initiative, is goal-oriented, and acts honestly and efficiently 1.2. (intermediate level): Works efficiently in a team (colleagues, project leader, client) during the experimental phase of a project through open communication. 1.5. (intermediate level): Critically reflects on the own role in the experimental phase of a project. 1.6. (intermediate level): Critically reflects on the own personality. 1.7. (intermediate level): Defines personal learning goals (based on project/work requirements). 4.5. (intermediate level): Contributes to the efficiency of meetings by being prepared. 4.6. (intermediate level): Is efficient in keeping the project leader informed on progress of the experiments.	*Depending on context of the (internship) workplace*	- Performance during internship shows that the student: - Takes initiative to find background information and formulates goals in keeping with the practical assignment. - Recognises opportunities and acts accordingly in keeping with own goals and the goals of the organisation. - Acts honestly and describes own conduct in an open and self-critical way. - Pro-actively approaches others to drive the project forward and uses an open communication: - Considers own needs and needs of others and offers solutions. - Expresses own opinion/question in clear statements. - Has consideration for own emotions and emotions of others.

Chance 2: November 2020 (ft), in agreement with student (pt) ***Compensation:*** None	5.9. (intermediate level): Performs his/her responsibilities.		- Is respectful for opinion/goals of others - Works according to personal development plans (collects information and analyses own performance, formulates learning goals, plans activities and evaluates results) - Describes awareness of personal characteristics. Shows awareness how these characteristics influences professional conduct in terms of strengths and weaknesses and is able to link them to own professional development and project progress. - Is prepared for meetings: has completed the actions as agreed upon on. Has read and prepared relevant documents and provides others with necessary information. - Pro-actively shares relevant information with the project leader and take minutes to document agreements and other relevant information. - Understands own role in the organisation, acts accordingly by performing the proper assigned tasks, and shows responsibility in

			the interest of the project /organisation.
Code modular exam: **MMLS-PRJM1-PC2**	***Competence indicators***	***Knowledge indicators***	***For this assignment, these indicators and knowledge criteria are translated into the following assessment criteria****
Name modular exam: Professional conduct 2 ***Type:*** Individual performance including assignments ***Number of examiners:*** 2 for construction and evaluation of criteria, 1-2 for assessment ***Assessment:*** Sufficient / insufficient ***Cut-off value:*** - ***Minimal result:*** sufficient ***Weighting:*** 0% ***Period and resit:*** 2 chances per study year;	1.3. (intermediate level): uses a professional network within the own organisation 1.5. (intermediate level): Critically reflects on the own role in the experimental phase of a project. 4.5. (intermediate level): Contributes to the efficiency of meetings by being prepared.	*Depending on context of the (internship) workplace*	- Actively contributes to the efficiency of professional and/or intervision meetings through various roles - Describes possible positions (roles, functions, tasks and responsibility) regarding the project; - Describes own positions within the project and, if possible, its own prospects. - Describes network: - Reflects on own needs based on own position; - Describes relevant persons in relation to own position, their position and expertise and how this can be used in the interest of the own position

Chance1: June/ August 2020 (ft), September 2019-august 2021 (pt) Chance 2: November 2020 (ft), in agreement with student (pt) ***Compensation:*** None			
Code modular exam: **MMLS-PRJM1-PP**	***Competence indicators***	***Knowledge indicators***	***For this assignment, these indicators and knowledge criteria are translated into the following assessment criteria****
Name modular exam: Project Proposal ***Type:*** Individual written professional product ***Number of examiners:*** 2 for construction and evaluation of criteria, 2 for assessment considering advice of workplace supervisor ***Assessment:*** Grade ***Cut-off value:*** 55% ***Minimal result:***	1.1 Shows a professional, pro-active, curious, scientific and entrepreneurial attitude: adapts quickly, motivates him/herself, shows initiative, is goal-oriented, and acts honestly and efficiently 2.2. Combines information from different sources in the context of the own project. 2.3. Defines the project aim in terms of products and/or results based on the acquired background information. 2.4. Defines the quality requirements for products and processes based on customer / legal requirements. 2.5 Designs different approaches that could lead to the project aim. Evaluates these possibilities and justifies the choice	*Depending on context of the (internship) workplace*	- A Project Work Plan (PWP) was written for the own project in professional practice including the background/ motivation, aim, deliverables and exclusions, phases, milestones, work packages, schedule, project risks, project organization and communication and required budget. - The background information explains the added value of the project. - The aim is in harmony with the background information.

5.5 ***Weighting:*** 100% ***Period and resit:*** 2 chances per study year; Chance1: May/June 2020 (ft), May/June 2020- June 2021 (pt) Chance 2: August/September 2020 (ft), in agreement with student (pt) ***Compensation:*** None	based on scientific arguments and practical parameters such as time, costs, quality and personnel 2.6. Designs a complete strategy leading to the project aim (project of about 3-4 months; see also: managing projects). 3.1 Designs experiments based on the required quality and quantity of the product or result. 4.1. (intermediate level): Reports project plans and results according to the standard format of scientific documents and the reader recognizes the scientific international conventions criteria. 4.2. Presents project plans and results in English to colleagues, other researchers in the field or to clients. The presentation is at a level equivalent to a presentation at an international symposium. 5.1. Defines project deliverables based on the needed quality and quantity. 5.2. Identifies project risks based on the (experimental) approach and on (putative) competitors. 5.3. Defines project exclusions.		- The deliverables are described in terms of specific, measurable products or results. Nouns are used to describe the deliverables. - Convincing arguments are given for the choice of approach. - The project approach is transparently described and is in line with the project aim and defined phases. - The approach leads to the defined deliverables on schedule and within budget. - Risks with high chance and important consequences are based on a risk assessment. Preventive measures to minimize the risks are defined. - The described exclusions efficiently restrict the project. - The activities are described leading to the identified (intermediate) deliverables. Verbs are used to describe the activities.

	5.4. Organizes the project in phases and defines decision points/milestones. 5.5. Describes the project organisation including the responsibilities of all project members. 5.6. Writes a communication plan concerning all project members and parties involved. 5.7. Describes a schedule based on the (experimental) plan. 5.8. Describes the required budget. 6.1.Actively involves different specialist to collect advise contributing to the progress of the project.		- The project is divided in phases in a logical way; milestones are defined. - The project organization described matches with the project approach. - The responsibilities of all project members are transparently described and match with their qualification and role. - The communication plan transparently describes the frequency and communication between different project members and relevant parties. The proposed communication serves the efficiency of the project. - The project is set in a realistic time frame. - The budget includes both personnel and material costs. Writing, minimum level:

			- The purpose of the document is clear; Text is connected and coherent (limited use of linking words and cohesive devices) - The document is written in correct scientific style: Uses everyday vocabulary and phrases, with occasional inappropriate use. - Simple, mostly correct grammar is used. Errors may be noticeable but the meaning can be determined Writing, excellent level: - Text is well organised and coherent. Paragraphs and a variety of linking words and cohesive devices are used) to generally good effect. - Uses a range of vocabulary and phrases, appropriately. Correct grammar is used with control and flexibility to convey intended meaning. Only occasional errors at most, but communication is not impeded. Project peer review: - Audience feels well informed in such a way that sufficient support for the project is obtained.

			- Is responsive on feedback obtained and shows attitude for implementing suggestions for improvement - Produces responses that are extended beyond short phrases, despite hesitation. - Uses mostly appropriate vocabulary when talking about familiar topics - Penalty points are subtracted in cases students missed the (intermediate) deadline

**** Note: Adjustments in the exact description of the assessment criteria can be made based on experiences with previous students groups with the aim to improve relevance, reliability and transparency of the assessment.***

General information	
Name of unit of study	Managing Projects 2
Code for unit of study	HMP-MMLS-PRJM2
Teaching period	September 2019 - February 2020
ECTS credits	7
Study load in hours	196
Study hours (contact hours)	20 contact hours and 176 hours learning on the (placement) workplace of which 56 hours related to professional products and 120 related to professional development
Entry requirements for unit of study (in categories)	• The modular exams “Professional Conduct 1” and “Professional Conduct 2” of the unit of study Managing Projects 1 are successfully completed for the assessment of “Professional Effectiveness” of the unit of study Managing Projects 2. • The modular exam “Project Proposal” of the unit of study Managing Projects 1 is successfully completed for the assessment of the modular exam “Reflection on Project Proposal Realisation and contribution” of the unit of study Managing Projects 2. All assessments of this module have to be sufficient.
Content and organisation	
General description	This unit of study is a follow-up of the Managing Projects 1. Focus is the training of the competences Professional conduct and Guiding the Professional Development, and Managing Projects. Students perform this unit of study in the context of their own (placement) workplace, and are supported in their development by various teaching and assessment activities. The core of this module is the development of Professional Effectiveness. As part of this, students investigate their professional identity by describing their own Strength-Weaknesses, Opportunities and Threats in the context of their professional developments towards master level. They define personal learning goals, work on realising these goals in their professional and study context, and reflect on this on a regular base. The training inter-personal effectiveness focusses on insights and skills required to efficiently contribute to and control projects within teams. Students become familiar with personal styles (MBTI test), leadership styles and communication styles, the concept of situational leadership and different organization cultures. Principles of time management, how to organize efficient project meetings and ways of dealing with conflicts are also part of this training. In the end of this unit of study, students critically reflect on the course of project(s) they were involved in and their own contribution to them.

	Students acquire knowledge and understanding during the trainings, and apply this in practice on their (placement) workplace. The experiences made in practice are discussed during classes. This unit of study is integrally carried out with the unit of study Research and Product Development Skills 2 which runs in parallel to this unit of study.
Exit qualifications	**Competence 1: Professional conduct and guiding professional development** Competence 3: Design, analysis and control of experiments Competence 4: Communication **Competence 5: Managing projects** Competence 6: Advising
Professional task	1. to understand practical, economic, social and/or ecological needs of businesses, market and society that can be anticipated by biotechnology 3. to implement such solutions in a successful and efficient way by organizing their realization in projects, considering the interdisciplinary dimension and communicating with different experts. Such projects have a duration of at least three months.
Cohesion	At the end of the module, all students have the knowledge and skills at that enable them to subsequently acquire the knowledge, skills and Competences characteristic for this master in Major Project unit of study. This unit of study is integrally carried out with the unit of study Research and Product Development Skills 2 which runs in parallel to this unit of study.
Mandatory participation	The participation in the placement according to the placement contract is compulsory for students enrolled in the full-time programme.
Maximum number of participants	The maximum number of participants is defined by the number of (placements) workplaces for the full-time programme. The number of participants taking part in this unit of study as part-time or modular student is unlimited.
Compensation options	None
Activities and/or instructional formats	Professional identity - Workshops, Intervision/ supervision Interpersonal effectiveness - Work styles, personal effectiveness, time management - Communication and communication styles - Situational leadership and styles in decision-making - Organisation cultures and handling conflicts, management game

	- Discussion of practical experiences Trainings are held in an interactive way where the transfer of theory is alternating offered with discussions and exercises.
Required literature / description of learning material	<u>Compulsory:</u> ❖ Reader Interpersonal effectiveness <u>Recommended:</u> ❖ Porny, S.E. (2010). *Projectmanagement for Dummies*. (3rd edition). John Wiley and Sons Ltd. ***The reading lists are updated regularly. Therefore, the actual reading list of this unit of study might deviate from the list presented above.***
Required software / required materials	-
Extra contributions (EER 2.7)	-
Examination	
Name and code [exams or modular exams]	*See exams of the UOS Managing Projects 2 below this table*
Assessment criteria	*See exams of the UOS Managing Projects 2 below this table*
Exam and modular exam format(s)	*See exams of the UOS Managing Projects 2 below this table*
Weight factor of modular exam	*See exams of the UOS Managing Projects 2 below this table*
Minimum result	5.5
Exam opportunities	*See exams of the UOS Managing Projects 2 below this table*
Number of examiners for individual exam type	*See exams of the UOS Managing Projects 2 below this table*
Permitted resources	none
Discussion and review	Within 10 working days after the results of an exam or modular exam, the examiner organises a group discussion, unless there is clearly no need for this among the students. After the group discussion or if there was no group discussion, you as an interested party are entitled to review and discuss your own work with your lecturer and the examiner, unless you could reasonably have already done this during the group discussion. You are allowed to review and discuss everything: the assessed exam or modular exam, the questions, assignments and marking system.

Exam of the UOS Managing Projects 2

<table>
<tr><td></td><td colspan="3">Assessment criteria/ Indicators / requirements</td></tr>
<tr><td></td><td>Competence indicators</td><td>Body of Knowledge and Skills</td><td>Assessment criteria</td></tr>
<tr><td>Code modular exam:
MMLS-PRJM2-R</td><td rowspan="9">1.4 Critically reflects on the project with respect to scientific project management approach and results.
1.5 Critically reflect on the own role in the course of a project.
5.13 Is flexible with changing circumstances by adapting the experimental, project and/or communication strategy.</td><td rowspan="9">Depending on context of the (internship) workplace</td><td rowspan="9">The student analysed the project he/she described in the project proposal described in the Managing Projects module part 1. He/she prepared a poster on which he/she gives the following aspects of the project (proposal) an appreciation from 1 (unsatisfactory), 2 (satisfactory), to 3 (could not have gone any better):
- Quality of the initial definition of the deliverables
- Planned scientific approach
- Defined exclusions
- Described risk analysis
- Described responsibilities
- Described communication plan
- Described time schedule
- Described budget
- Working towards the deliverables
- Effectiveness of communication during the project
- Sticking to responsibilities
- Controlling resources
- Effectiveness and efficiency of meetings
- Quality of presentations</td></tr>
<tr><td>Name modular exam:
Reflection on project proposal realization and contribution</td></tr>
<tr><td>Type:
Active participation in group discussion</td></tr>
<tr><td>Number of examiners:
2 for construction and evaluation of criteria,
1-2 for assessment</td></tr>
<tr><td>Assessment:
sufficient/insufficient</td></tr>
<tr><td>Cut-off value:
-</td></tr>
<tr><td>Minimal result:
sufficient</td></tr>
<tr><td>Weighting:
0%</td></tr>
<tr><td>Period and resit:
2 chances per study year;
January 2020 (ft), January/February 2020 – August 2021 (pt))</td></tr>
</table>

Chance 2: January 2020 (ft), in agreement with student (pt) ***Compensation:*** None			- Dealing with conflicts - Team effectiveness - Situational leadership - The student identified factors that were critical to the failure or success of the project and critically discussed these factors with fellow students. - He/she has a reflective and improvement-oriented attitude in this discussion. - The student adds a well justified description of critical factors for the success of the own graduation project and of specific and measurable actions how to be in control of these factors to the poster and submits the poster as assessment product.
Code modular exam: **MMLS-PRJM2-PE**	***Competence indicators***	***Knowledge indicators***	***For this assignment, these indicators and knowledge criteria are translated into the following assessment criteria****
Name modular exam: Professional Effectiveness ***Type:*** Individual assessment of professional	1.1. Shows a professional, pro-active, curious, scientific and entrepreneurial attitude: adapts quickly, motivates him/herself, shows initiative, is goal-oriented, and acts honestly and efficiently	- Has insight in different factors that contribute to an effective communication process. - Is aware of his own cognitive style and recognizes the styles of team members.	Novice level: - meets all criteria of indicator 1.1. (left) to some extend - Organized and moderated meeting

performance, written products ***Number of examiners:*** 2 for construction and evaluation of criteria, 1-2 for assessment considering advice of workplace supervisor ***Assessment:*** Grade ***Cut-off value:*** 55% ***Minimal result:*** 5.5 ***Weighting:*** 100% ***Period and resit:*** Chance1: January/February 2020 (ft), January/February 2020 – August 2021 (pt) Chance 2: March 2020 (ft), in agreement with student (pt) ***Compensation:*** None	1.2 Works efficiently in a team (colleagues, project leader, client) during all phases of the project through open communication and by considering the needs of others 1.3 Pro-activity contributes to setting up and maintaining a professional network. 1.6 Critically reflects on the own personality and how this influences professional conduct. 1.7 Defines personal learning goals (based on project/work requirements) and guides personal development to reach learning goals 4.2. Presents project plans and results in English to colleagues, other researchers in the field or to clients. The presentation is at a level equivalent to a presentation at an international symposium. 4.4 Organises and moderates meetings 4.5 Contributes to the efficiency of meetings by being prepared and actively participating 4.6 Keeps client and project members informed about project progress at all stages, especially when the project is not progressing as planned	- Knows how to deal with possible conflicts. - Is aware of intercultural differences. - Knows the principles of situational leadership.	- Is prepared for meetings and has a constructive contribution aiming for efficiency - showed insight in different factors that contribute to an effective communication process, e.g. by being aware of subjective perception and nonverbal communication - gives regular progress updates (written and/or meetings); highlights deviations of original plan; informs about crucial developments/ outcomes - considers own (project) goals, common goals and needs of others and communicates to work efficiently in team - Mostly sticks to his/her own responsibilities/ agreements - Shows awareness of organisation culture and/or intercultural differences - Actively deals with different opinions and/or conflicts; approaches others when they do not perform to their responsibilities - Uses network to work towards (project) goals, extends it if required for a task

	4.7 Shows initiative to adapt communication styles to the others and the situation at hand 5.9. Sticks to his/her responsibilities 5.10. Approaches others if they do not perform to their responsibilities.		- Prepares a SWOT in the context of being a project-responsible master. Analyses own personality and how this influences professional conduct - Uses the SWOT analysis to set-up a personal development plan and uses this to work towards learning goals - Participates actively during the training programme. Speaks up when necessary - The student recognized the style of leadership of his manager/ project leader - Recognized own cognitive style and cognitive style of manager/ project leader / colleagues - 'Intermediate' level: - meets all criteria of indicator 1.1. (left) to large extend Organized and moderated meetings. Took actions to make meetings efficient - (novice level description) … and contributes to efficiency of meetings - (novice level description).. and attempts to deal with these factors in the interest of the project/ organisation - Pro-actively gives progress updates (written and/or meetings); highlights deviations of original plan; pro-

			actively informs about crucial developments/ outcomes - (novice level description) … and thereby mostly works efficiently within the team - (novice level description) … and in a way that contributes the progress of the project - (novice level description) … and pro-actively extends his/her network - Always sticks to his/her own responsibilities / agreements - Anticipates on organisation culture and /or intercultural differences - Prepares a SWOT in the context of being a project-responsible master. Analyses own personality and how this influences professional conduct in a self-critical manner - And acts as reflective practitioner: analyses own performance, undertakes activities supporting professional development at critical points. - Evaluates activities according to a personal development plan. - Participates pro-actively during the training programme. Pro-actively contributes to the progress and/or quality of the meetings - (novice level description) ... and can explain the consequences for the

			interaction with his/her manager/project leader - (novice level description) … and can explain consequences for interaction 'Advanced' level: - Fully meets all criteria of indicator 1.1. (left) - Organized and moderated efficient meetings - (intermediate level description) … and contributions are of good quality pushing forward the development of own projects - (intermediate level description) …and deals with these factors in the interest of the project/ organisation - (intermediate level description) … and suggests adequate adaptation - (intermediate level description) … and thereby always works efficiently within the team - Has a broad perception of the responsibilities belonging to his/her role and mostly takes these responsibilities - (intermediate level description) … and deals with it in the interest of project and company success - Consistently deals with different opinions and/or conflicts; approaches others when they do not

			perform to their responsibilities in a way that contributes the progress of projects - Sets up and uses a network to diligently and effectively work towards (project) goals - Prepares a SWOT in the context of being a project-responsible master. Systematically and comprehensively analyses own personality and how this influences professional conduct in a self-critical manner - Act as reflective practitioner: analyses own performance systematically, continuously undertakes activities supporting professional development. - Evaluates activities according to a personal development plan. - Participates pro-actively during the training programme. Consistently and pro-actively contributes to the progress and/or quality of the meetings - (intermediate level description) … and anticipated on this style - And anticipated on this style in the interest of the project 'Expert' level: - And is an example to others

			- Organised and moderated meetings of outstanding quality, also compared to experienced colleagues - (advanced level description) ... and contributions are of outstanding quality pushing forward the development of groups projects - Is extremely effective in using appropriate communication styles pushing the success of the project/ organisation forward - (advanced level description) and suggests the most appropriate adaptations - (advanced level description)... and thereby works extremely efficient within the team. - Has a broad perception of the responsibilities belonging to his/her role and always takes these responsibilities - (advanced level description) ... and deals with it in the interest of project and company success in an exceptional way - (advanced level description) ... and team performance - Pro-actively extends and maintains network in the interest of project goals and company goals

			- And is an example for others in his/her improvement-oriented attitude - And is an example for others in his/her improvement-oriented behavior - Has exceptional contributions to the quality and/or efficiency of meetings/ management games - (advanced level description) … and anticipated on this style in a very effective way - (advanced level description) … and anticipated on this style in a very effective way

**** Note: Adjustments in the exact description of the assessment criteria can be made based on experiences with previous students groups with the aim to improve relevance, reliability and transparency of the assessment.***

General information	
Name of unit of study	Graduation Project
Code for unit of study	HMP-MMLS-GP
Teaching period	September - August
ECTS credits	30
Study load in hours	840
Study hours (contact hours)	Approximately 10 contact hours with HAN lecturers 60 hours to write the project proposal, 690 hours project work, including practical work, 60 hours to write the master report and project reflection and 20 hours to prepare the presentation and defence
Entry requirements for unit of study (in categories)	Successful completion of the exam of the unit of study “Fundamentals”, “Drug Discovery and Development”, “Production of Biomolecules 1 and 2”, “Vaccines and Diagnostics”, “Research and Product Development Skills 1 and 2” and “Managing Projects 1 and 2”
Content and organisation	
General description	Students work individually on a project in applied/translational research or product development in biotechnology/pharmaceutical companies or other R&D institutions. Such projects can contribute to the development of bio-assays, diagnostic tests, vaccines or drugs, the production of enzymes or other biomolecules of industrial use, among many other possible applications. Students plan and control their project. Upon finalisation, reports on the results and a reflection on the course of the project are written. The project is defended and answering the questions of the examers is the last proof-of-competence during this master programme.
Exit qualifications	Competence 1: Professional conduct and guiding professional development Competence 2: Designing strategies for applied research and product development Competence 3: Design, analysis and control of experiments Competence 4: Communication Competence 5: Managing projects Competence 6: Advising
Professional task	1. to understand practical, economic, social and/or ecological needs of businesses, market and society that can be anticipated by biotechnology 2. to apply fundamental knowledge in the area of molecular life sciences to find sustainable solutions for these needs 3. to implement such solutions in a successful and efficient way by organizing their realization in projects, considering the interdisciplinary dimension and communicating with different experts.

	Such projects have a duration of at least three months.
Cohesion	During this final unit of study, all competences of the Master in Molecular Life Sciences are integrally applied and further developed to reach the final qualifications of this applied master programme
Mandatory participation	The participation in the placement according to the placement contract is compulsory for students enrolled in the full-time programme.
Maximum number of participants	The maximum number of participants is defined by the number of (placements) workplaces for the full-time programme. The number of participants taking part in this unit of study as part-time or modular student is unlimited.
Compensation options	None
Activities and/or instructional formats	Placement in the professional practice. Literature studies, writing project plans and results, controlling experiments, team work, work meetings, project presentations and discussions
Required literature / description of learning material	Compulsory: ❖ Graduation project handbook ❖ Specialized literature relevant to the project Recommended: ❖ Scientific literature relevant to the specific project.
Required software / required materials	Dependent on the specific project.
Extra contributions (EER 2.7)	-
Examination	
Name and code [exams or modular exams]	Graduation Project integral exam MMLS-GP-Final
Assessment criteria	*The assessment criteria will be directly derived from the following final qualifications:* *Competence 1: Professional conduct and guiding professional development* 1.1. Shows a professional, pro-active, curious, scientific and entrepreneurial attitude: adapts quickly, motivates him/herself, shows initiative, is goal-oriented, and acts honestly and efficiently 1.2. Works efficiently in a team (colleagues, project leader, client) during all phases of the project through open communication and by considering the needs of others. 1.3. Pro-activity contributes to setting up and maintaining a professional network. 1.4. Critically reflects on the project with respect to scientific project management approach and results. 1.5. Critically reflect on the own role in the course of a project. 1.6. Critically reflects on the own personality and how this influences professional conduct.

	1.7. Defines personal learning goals (based on project/work requirements) and guides personal development to reach learning goals *Competence 2: Designing strategies for applied research and product development* 2.1. Is able to independently acquire knowledge in a new subject by consulting specific literature and other resources; is able to identify reliable and suitable sources; Discriminates between major and side issues 2.2. Combines information from different sources in the context of the own project 2.3. Defines the project aim in terms of products and/or results based on the acquired background information 2.4. Defines the quality requirements for products and processes based on legal requirements. 2.5. Designs different approaches that could lead to the project aim. Evaluates these possibilities and justifies the choice based on scientific arguments and practical parameters such as time, costs, quality and personnel 2.6. Designs a complete strategy leading to the project aim (project of about 3-4 months; see also: managing projects) 2.7. Identifies opportunities to patent products, results and strategies *Competence 3: Design, analysis and control of experiments* 3.1. Designs experiments based on the required quality and quantity of the product or result. 3.2. Applies strict logical thinking to draw conclusions from the results and interprets them: - in the context of the experiments - in the context of the project aim (helicopter view) - in comparison to other analyses, reference/theoretical values, and quality requirements. 3.3. Solves practical problems if experiments do not work as planned (trouble shooting); couples back to the theory or consults colleagues if necessary; suggests alternative experiments. *Competence 4: Communication* 4.1. Reports project plans and results according to the standard format of scientific documents and meets the scientific international conventions criteria 4.2. Presents project plans and results in English to colleagues, other researchers in the field or to clients.

	The presentation is at a level equivalent to a presentation at an international symposium 4.3. Describes the key message of the project relevant for patenting, registration, and/or business development. Uses terminology that is understandable for experts from different departments 4.4. Organises and moderates meetings 4.5. Contributes to the efficiency of meetings by being prepared and actively participating 4.6. Keeps client and project members informed about project progress at all stages, especially when the project is not progressing as planned 4.7. Shows initiative to adapt communication styles to the others and the situation at hand *Competence 5: Managing projects* Takes responsibility for a project by: 5.1. Defines project deliverables based on the needed quality and quantity 5.2. Identifies project risks based on the (experimental) approach and on (putative) competitors 5.3. Defines project exclusions 5.4. Organizes the project in phases and defines decision points/ milestones 5.5. Describes the project organisation including the responsibilities of all project members 5.6. Writes a communication plan concerning all project members and parties involved 5.7. Describes a schedule based on the (experimental) plan 5.8. Describes the required budget 5.9. Performs his/her responsibilities 5.10. Approaches others if they do not perform to their responsibilities 5.11. Sets priorities and works efficiently towards the defined project aim/deliverables 5.12. Is in control of the project during all phases by being pro-active if the project does not run according to the plans and initiating an alternative strategy 5.13. Is flexible with changing circumstances by adapting the experimental, project and/or communication strategy 5.14. Obtains the deliverables in time and with the described resources; if not, reasons and justifies the decisions that have been taken in the course of the project *Competence 6: Advising* 6.1. Actively involves different specialist to collect advise contributing to the progress of the project.

	6.2. Actively participates in a discussion about related projects by asking critical questions and suggesting follow-up experiments. 6.3. Advises about follow-up projects of the own project. 6.4. Integrates own project results in the multidisciplinary defined goals and advises other departments 6.5. Gives advice about choosing new equipment or methods based on project goals, overall goals and available resources
Exam and modular exam format(s)	individual final
Weight factor of modular exam	100%
Minimum result	5.5
Exam opportunities	2 chances per study years, depending on student
Number of examiners for individual exam type	2 for assessment
Discussion and review	You are allowed to review and discuss everything: the assessed exam or modular exam, the questions, assignments and marking system.