Self-Evaluation Report

Study Programme:

Bachelor & Master in Engineering Science

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Criterion 2: Curriculum

Indicator 2.2: Demands Professional and Academic Alignment

Throughout the bachelor's programme, we pay attention to the realisation of the following competences: *critical reflection, logical reasoning, and communication of ideas, concepts* and *problems.* These skills and attitudes are inherent to the discipline of engineering because systematic questioning, critical reflection and the development of creativity are present at its core. The Bachelor in Engineering is expected to be able to question an existing situation, whilst taking into account the social, technological and economic context. Based on that, students are able to come up with alternative, innovative solutions that have a demonstrable surplus value.

Processing, obtaining and applying knowledge that originates in very diverse disciplines of the knowledge domains is a necessity with regard to engineering. Because the knowledge is shared in a skill-oriented way, it is easier for students to implement it. They've become accustomed with the systematic working method of engineering science because it is introduced at the start of the study programme.

We choose a project-oriented education that emphasizes innovative engineering, which involves a greater amount of unknown parameters. When new ideas are defined, research and engineering competences are necessary. Attitudes like *critical reflection* and *logical reasoning* are imperative in this discipline.

Masters of Engineering are expected to realize an increased command of the bachelor's competences. The study programme emphasizes on independent planning and on taking on a leader's role.

2.2.1 Knowledge and competence development in the curriculum

Bachelor

In the bachelor's programme, knowledge development takes place within the 3 knowledge domains of the curriculum (applied human sciences, applied economical sciences and applied technological sciences), the integrating research methodology domain and engineering methodology domain. Every one of those three knowledge domains is supported by courses in order to develop a wide range of disciplines. Next to that, the curriculum also pays attention to the students' acquisition of knowledge with regards to research and engineering methodologies through specific courses.

Master

The master's curriculum also focuses upon knowledge development within those 3 knowledge domains and on integrating domains of research methodology and engineering methodology. Every one of those three knowledge domains is supported by courses in order to develop a wide range of disciplines. Next to that, the curriculum also pays attention to the acquisition of knowledge with regards to research and engineering methodologies through specific courses. In 2 other courses students obtain knowledge independently.

The highest level of knowledge acquisition on scientific disciplines takes place in the standard study programme of B.A. 1 and B.A. 2. The sequence of courses in the curriculum guarantees a direct application of the obtained knowledge when confronted with different engineering assignments. In this way, students learn to improve their engineering skills. This attitude stimulates life-long learning; an attitude crucial to engineers in the professional field.

The use of specific software and the presence of the laboratories to experiment extensively (e-lab, view lab and laboratory model building) support students in their growing knowledge development.

2.2.2 Development of social and professional competences in the curriculum

General competences get a lot of attention within the wide range of available courses – such as 'obtains logical competences' and 'is able to cooperate and communicate'. There is less attention for the competences 'takes into account social and temporal contexts', 'has a scientific approach' and 'is capable to research' in the current bachelor's study programme. We expect students to develop those competences mostly in the master.

The competence domains hold skills such as: the development of analytical thinking/reasoning, a critical and problem-solving attitude, self-activity, a sense for individual and creative thinking, IT skills, calculation skills including relevant use of a computer and communication skills. These skills have a developing character and help students to function socially and professionally in their later lives. The development of these general competences starts in basic courses for knowledge development in the knowledge domains. They contribute strongly to the development of abstract reasoning, general reasoning and critical sense in students because of their specific didactic and development value.

Bachelor

Social skills

Project education (specifically professionally-oriented courses) is aimed at teaching students to function independently and in team. We aim at a balanced mix of individual and team work.

Early on in the study programme, we already introduce project work as a didactic work form. Students practice their communicative and social skills during consultations in which they individually discuss the results of engineering assignments with a lecturer, but also during their oral presentations in front of peers, lecturers and individuals that come from outside the institution. Social skills are also stimulated through participation in curricular and extra-curricular activities or in management boards and committees within the institution. In that way, students get to know the study programme from different perspectives, more specifically from a social perspective and a policy perspective.

Skills related to the professional field

We encourage students to collect information from producers and companies in function of their engineering assignments. If possible, we focus on concrete questions that are raised by the industry to realize a basis that can help make an assignment concrete. Especially during the last engineering assignments of the bachelor's degree, we systematically cooperate with various companies. We create a realistic context, e.g. by company visits and making available the necessary didactic material. We also involve individuals from outside the institution in giving temporary feedback and the final evaluation to increase students' professionally-oriented competencies. In addition to that, guest lecturers are taken aboard to provide guidance for parts of specific courses. This formula guarantees a concrete alignment with realistic situations that may occur in the work field. It involves professional experience in student-oriented guidance and it keeps the contents of the engineering assignments up-to-date.

Students are also confronted with professionals from the work field via a workshop week and a lecture series. These activities provide insight through real experiences and the execution of

engineering cases. In this way, students get acquainted with other didactic work forms, international perspectives or best practices that exist in the work field.

Internships and the participation in competitions are encouraged but the study programme doesn't actually support these activities.

Master

Social skills

Through project-oriented education, students develop the attitude to work independently as well as in team. In the organisation of this didactic form, we aim to find a good balance between individual work and team work.

For their master's thesis, we expect students to look for an academic or industrial supervisor. Students are responsible for appointments, contacts and contracts with the different individuals involved, but also for the information flow and feedback between them. In addition to that, contacts with different target groups, and the enquiring or observing of users asks for social skills and empathy. We also stimulate students to take part in activities organized by the institution or others, in management committees and boards of the study programme and department, or in the study programme's communication community that gathers students who work on the communication policy. In that way, master students get a chance to practice and increase their social skills within the context of the study programme.

Skills related to the professional field

We organise engineering projects, preferably, together with companies or research institutions. That is why we have been working together with *Philips* and *Procter & Gamble* on an electronics project since 2005. We also cooperate with an spin-off centre of a Flemish university. Guest lecturers are attracted to provide guidance in certain parts of courses. Professionals also provide guidance during workshops, give guest lectures and are guest lecturers during the *Innovation Week* that we organise. This formula guarantees a concrete alignment with realistic situations that occur in the professional field, an incorporation of professional experience in the guidance of students and a guarantee that the contents of engineering assignments remain up-to-date.

We encourage the cooperation with industrial or academic supervisors for the master's thesis. We also offer students to participate in projects that have been initiated by the industry or by research institutions. From 2008-2009 on, we offer the course *Internship*. This allows students to take part in projects that are organised by the industry or by research laboratories.

2.2.3 Integration of recent international developments

Both the bachelor's and master's degree allow students to keep up with recent developments in the work field through the organisation of lectures and workshops. For about 10 years, we have been inviting internationally renowned engineers and lecturers to guide projects for a week or give a series of lectures that are linked to the same theme.

The dynamics of the *Innovation Week* (Master) contribute to the alignment with recent, international developments. The initiative's lectures and exhibitions can also be attended by bachelor students. In 2007, the Innovation Week's theme was *Kyoto design* in which international companies participated.

The educational staff's and researchers' participation in international seminars and scientific conferences, workshops and juries as well as their membership of various international organizations and initiatives contributes to an education that is aligned with the international context. The

embedding of research activities in education supports the alignment with developments in the professional field.

2.2.4 Research-oriented education

The study programme's research activities are located in 3 discipline groups that concur with the 3 knowledge domains of the study programme:

- Engineering driven by social sciences
- Engineering driven by technological sciences
- Engineering driven by economical sciences

At this moment, projects are set up in cooperation with the industry and the medical sector. In addition to that, we safeguard the education's quality by implementing education-research. In this way, we evaluate and improve the study programme's didactic work forms and strategies. The results that follow from cooperations with the industry are implemented in the curriculum. These project results are incorporated in engineering assignments and return in course contents.

From 2005-2006 on, we introduce active research in the 3rd study year of the bachelor's programme in the form of a course called *Scientific Frameworks & Research*. In this course, we present current research, researchers and research organisation to the students. Staff members following a Ph.D. programme or those who have a Ph.D. also incorporate their own research results or strategies in their courses. This also guarantees that the courses' contents are always up-to-date. Ph.D. students also provide guidance in project education; this allows Ph.D. students to pass on specific expertise, which they have gathered by researching, to the students.

The internal newsletter of the study programme communicates about researchers' activities to students and (other) lecturers – such as the participation in international conferences or the start of a new research project.

The new initiative for master students *JOB FOCUS* is also open to bachelor students. It comprises of an afternoon during which students can listen to testimonies concerning Ph.D. programmes and research environments.

Master

Students (specialization *Research*) can conduct research for their master's thesis within one of the current Ph.D. research domains. A Ph.D. student will take upon the guidance of the master student. In that way, students get a chance to participate in research activities and they can contribute to the cultivation of new knowledge. Through the optional course *Research*, students can participate in current research. In that case, they will work on a clearly defined part of a greater research project and they will be guided by the research coordinator and the responsible for that research.

2.2.5 Development of research skills and attitude.

The attention for research competences has increased over the last few years. A questionnaire directed at students and lecturers, however, shows that the focus on research is still perceived as insufficiently present. Nonetheless, engineers do use research techniques frequently. For example, in the analysis of a problem's or opportunity's context, in an enquiry or observation of the user,…

On top of that, the recognized design methodologies are the result of research into the engineering process. An expert in engineering is characterized as someone with a research attitude and an integration of research in the product development process. Within the study programme, the need exists to expand the knowledge on research competencies and methodologies. That is the reason as to why lecturers take part in current research more often and start new research themselves. New appointments for lecturers can only take place if the candidates have a Ph.D., as is specified by the recruitment policy of the educational policy plan. In the future, bachelor students will also have to participate in this research. Lecturers who are active in research will be responsible for the systematic application of research in the study programme. We will also participate more intensively in industrial practical-oriented research.

Bachelor

The contents of the courses *Scientific Frameworks*, *Statistical Data Processing* and *Social Studies 5* and *6* focus on the realisation of research skills such as:

- The ability to undertake a literature study
- The realisation of scientific research
- The analysis of results
- The recognition of scientific articles

The study programme's evaluation that took place in 2005-2006 taught that 60% of the bachelor students think the research component is sufficiently present in the different courses. Yet, students also think the programme doesn't pay enough attention to citations and referencing (55%, excluding B.A. 3). Half of these students indicate that they feel not fit to take up on scientific research individually. That realisation is completely in line with the expectations of the bachelor's degree competences. The expected competences do mention that students can create a research plan and execute it *under guidance,* i.e. not individually. Only 55% of students feel an interest in scientific research is sufficiently stimulated. Only 25% of students hold the opinion that they have sufficient knowledge on digital databases.

Master

The goal of the course *Goals and Budgeting* is to increase the level of command of the bachelor's degree's research competencies. This will prepare students for their master's thesis. During the practicum of the course, students apply their knowledge onto research techniques to draw up a motivation of the master's thesis' research domain. In the *Applied Sciences* courses, the level of command of the research skills is increased again. In doing this, students prove they have the correct research attitude to set up a limited research individually. They also prove they have the research skills to conduct research and to report about it. The goal is to participate more intensively in industrial practical-oriented research. These projects also allow a direct feedback to the educational activities. Next to that, the participation of students and lecturers is easily realisable here.

The study programme's evaluation showed that only a limited number of students feel that the research component in the master's programme's courses is sufficient (30% in M.A. 1 and 45% in M.A. 2). 60% of master students think of themselves as capable to conduct scientific research. The

students' interest in scientific research is increasingly stimulated (from 50% to 70%) and a growing number of students feel they possess an overview of the various research methods and techniques (from 50% to 80%). The overview that students feel they have over digital databases has also increased from 30% to 70%. 70% of students declare having a sufficient insight in the research process. The reason for that is the adjustment that was made to the courses' contents and the didactic forms of the research related courses (Master's degree). During the following academic years, we will improve all these aspects. That is why lecturers have to evolve simultaneously. After all, the same questionnaire showed that only half of the lecturers pay attention to citation and referencing.

2.2.6 Conclusions, points of improvement and improvement trajectories

Bachelor

A range of initiatives led to a good alignment of the study programme's profile with the competences expected by the work field. In comparison to this professional orientation, the academic orientation currently exists up to a sub-optimal level. The embedding of research in education has grown over the last three academic years through the integration of active researchers and research results in the curriculum. At the same time, the adoption of academic standards must be extended and optimized.

Master

The study programme's profile is adjusted to the professional field's expected competences. Yet, we continually enhance the cooperation with the industry and the academic world. We ask supervisors to fill out a questionnaire, and based on their answers we adjust the cooperation. We are also expanding *Research*. The embedment of research in education is growing because of the integration of active researchers and research results. And we are expanding that as well. We consolidate the cooperation with supervisors that have an academic background. We also have organized the optional course *Internship* since the academic year 2008-2009. This allows students to participate in scientific research in research centres and companies outside of the study programme.

Criterion 4: Students

Indicator 4.1: Assessment and Testing

4.1.1 Organisation of evaluations

The Department Board of the Department Engineering Sciences is responsible for the coordination and organisation of exams. The Study Programme Board advises the Department Board.

The examination regulations that apply to students enrolled in the programme are those that apply to all students that are enrolled at the institution. The examination regulations, however, are extended with complementary articles that apply to the study programme. The full examination regulations can always be consulted online.

Two exam periods are organized per academic year. These are recorded in the academic calendar. The first exam period always ends before July 15th and the second before August 15th. Exam weeks are planned at the end of every semester for the first exam period. Every time the exam periods are preceded by some school-free study weeks. In the exam weeks, theoretical courses are examined that were organized in the concluded semester. Results of engineering-related courses must be submitted before the study weeks start. Possible final juries are also brought together at that time. Temporary juries can be assembled during the semester. The second exam period (with possibilities to retake exams) is planned at the end of August – beginning of September. For a small amount of courses there is no possibility to retake the exam during the second exam period. These courses are mentioned in the examination regulations.

The exam schedule of the first exam period and the dates of temporary and final juries are known at the start of the academic year and they are mentioned in the timetable that can be consulted online from the beginning of the academic year on. The exam schedule will be added to the time table in the beginning of March. Changes in the exam schedule can happen if a timely request is made by the Student Board. These changes will be communicated on the notice boards. Students with an individual programme can make agreements with lecturers to avoid simultaneous examinations (i.e. overlaps).

The study programme's evaluation (2005-2006) showed that the communication on the timing (50%), the location (45%) and additional information (45%) concerning the evaluations were regarded as sufficient by a minority of the students: 45% on average. This is a drastic drop in comparison to the earlier enquiry: 70% on average.

4.1.2 Variation of evaluation forms

Evaluations test to what degree students have realised the final objectives and gathered the final, expected competencies. To do so, we use different evaluation forms. We communicate about all used evaluation forms through each course's content and objectives description. These are available online.

We use the following evaluation forms when assessing:

Knowledge assessment	A test that verifies whether the students obtained all the expected knowledge at the end of a certain study period.
Advancement assessment	A knowledge assessment that periodically tests the students' *body of knowledge*. It exists out of a large amount of questions on all material that the students must know.

Project assignment	Possibly a simulated question or assignment by a company, organisation or institution that is solved individually or in team.
Portfolio	A digital folder or a hard copy that collects products, reports and (self-)evaluations. The students select products that they find representative. The portfolio can have a formative or a summative function.
Graduation assignment	A final, individual assignment that concludes the curriculum.

We also distinguish between permanent and period-bound evaluations:

A permanent evaluation consists of the grades on practicum exercises, seminars or project work that students receive every semester. These grades are part of the final evaluation of courses. At the start of each semester, it is communicated to the students (through the online course descriptions) what amount of their final grade is made up out of permanent evaluation.

Via *period-bound evaluation* (exams), we test whether students have reached the expected objectives of a specific course. This happens by measuring their knowledge and insight as well as their ability to apply that insight. Knowledge assessments are oral or written in form. The lecturer communicates his expectations, demands and evaluation form(s) to the students beforehand. He also communicates on the weight of the different evaluation forms in the final grade.

When assessing the project assignments, the main evaluation criteria are the integration of the basic techniques that were taught in the theoretical courses as well as the obtained engineering related skills. This evaluation is not solely result-based. We also take into account the insight in associations and links, the process and the application of taught methodologies and verification techniques. For the engineering assignments, we communicate the evaluation criteria at the start of the course. The different supervisors have great independence in evaluating the assignments. After the individual assignment, the lecturers get together in a mutual meeting. For one specific course, periodic evaluation by a jury is planned.

Lecturers have great autonomy in the assessment of tests and assignments. The evaluation results in a score (made up out of a natural number) on 20. A score under 10 is considered a failing grade.

The study programme's evaluation (2005-2006) shows that 70% of students feel the evaluation form is fit. The relevance of knowledge assessment (70%) and competences (80%) is also sufficient. However, the assessment of attitudes is only seen as sufficient by half of the students.

4.1.3 Operation of Examination Committee

The examination procedure and modalities are recorded in the exam regulations that are published on the website and that can be consulted by students.

The examination committee gathers after each examination period. The minutes of their gatherings mention per student:

- The composition of the examination committee;
- The individuals who are present but also those who are apologised, absent and have given authorizations;
- The method of decision;
- The used deliberation criteria;
- The decisions taken on passing a course and/or the whole study programme;
- The interventions of the ombudsperson;

- The grades for each course;
- The obtained credits;
- The courses that have to be retaken to obtain a diploma (if applicable);
- The level of distinction/honours (if applicable).

The ombudspersons attend the gatherings and have a mediating function.

At the start of the second semester, students can pick up a list of exam results, which is made up out of the courses, for which an examination was held in the first semester, at the student secretariat. The examinators' feedback will be send out a week after the publication of the results or can be obtained via appointment.

4.1.4 Evaluation Transparency

Lecturers communicate the specific examination demands, objectives and forms to the students in advance (usually during class). Students will also gain insight in the relative importance of the different courses. Some lecturers will also make exams and tests available from previous years. The evaluation criteria and specific evaluation and examination forms are described in the course descriptions, which can be consulted on the website.

The evaluation of some project courses needs special attention because we lack exact *answers* in those. Therefore, the evaluation has to happen based on the realization of the course's objectives in the project. Feedback becomes very important in that light, as it is the only way to avoid that students make the same mistakes twice. This individual guidance exists in the form of consultations during (exercise) seminars. The status and advancements that have been made by the student are kept in *project follow-up forms*. Lecturers have a great independence when it comes to filling in these individual feedback forms. At the end of an exercise, some lecturers also send an individual, concluding discussion on the final result to the students.

The collected examination results from the first semester have been communicated to students during the third or fourth week of the second semester since the academic year 2005-2006. Usually this happens at the end of February or beginning of March. We communicate through a personal document that can be collected from the student secretariat. The motivation enquiry and study programme's evaluation showed this was a point of attention. Until 2005-2006, it wasn't possible to officially communicate exam results.

The results of the complete first examination period and of the second examination period are communicated personally and in writing after the public proclamation of the final results. After the proclamation, students have the possibility to discuss the examination results; this also includes the right to look into the personal, written exam copy. After the first semester, we organise a feedback session during which students can review their exams.

Students and lecturers are informed on all aspects of the evaluation process and results in a timely and accurate fashion. However, if a student feels that he/she has been disadvantaged during the evaluation, he/she can turn to the ombudspersons.

The motivation enquiry and the study programme's evaluations show that students feel their tests and assignments are evaluated in a correct and fair manner. The last study programme's evaluation (2005-2006), however, shows that only 55% of students think the evaluation criteria are clear. This is a slight increase with regards to the previous evaluation. This lack of transparency has thus improved slightly but students still see it as the evaluation's weak spot.

4.1.5 Quality Assurance of Evaluation and Assessment

The Department Board is responsible for the regulations and organisation of the examinations. The Study Programme Board advises the Department Board and it overlooks the quality of assessments and evaluations through internal quality assurance.

In the study guide, the evaluation forms for every course are mentioned. The academic staff is responsible for the alignment of the exam questions with the objectives, with regards to content and quality. At the moment, a minority of the lecturers has had didactic schooling. The planned educational professionalization will be a definite surplus value with regards to the evaluation policy since lecturers will develop a better overview of the different evaluation forms and their possible applications.

During the study programme's evaluation, we made enquiries on different evaluation and assessment aspects:

- Did you receive the moment of examination in time?
- Did you receive the location of examination in time?
- Did you receive information on the examination form in time?
- Did you have enough time to complete the actual examination?
- Was a relevant examination form used?
- Was your knowledge tested in a relevant way?
- Were your attitudes tested in a relevant way?
- Were your competences tested in a relevant way?
- Were the evaluation criteria clear?

From the evaluations, it appeared that a majority of bachelor students (70%-95%) were rather or completely satisfied with the evaluation and assessment. The weakest aspects of the evaluation policy are the clarity of the evaluation criteria and the communication on the examination moments and locations. That is why the information on the examination moment and its location has been incorporated in the online timetable of each semester since 2006-2007.

4.1.6 Conclusions, Points of Improvement and Improvement Trajectories

The study programme's evaluation showed that more than 50% of students were rather or completely satisfied with the used examination forms and that they felt evaluations were fair. The examination form is aligned with the evaluation of the realized competences. Yet, there is clearly a need for educational professionalization with regards to assessment and evaluation. That's why the study programme organises and participates in study afternoons with didactic experts.

The study programme will establish a Didactic Professionalization Team. This team will be responsible for setting up a clear and operational evaluation policy. In doing that, special attention will go out to the evaluation of attitudes, and the formulation and communication of evaluation criteria to students. The evaluation criteria will also be part of the course descriptions.

Vagueness in communication on the moment, location and modalities of the evaluation will be improved by 1) drawing up a policy to use the available means of communication uniformly and consequently; and 2) adjusting and streamlining the agreements on handing in tasks, papers and assignments and the timely and straight-forward communication on those actions.

The enquiries also showed that students weren't pleased about the fact that examination scores weren't made available at the end of the (first) semester. This dissatisfaction led to the obligatory announcement of examination scores. This rule was added to the examination regulations. These mention that the scores of all individual courses will be announced within 40 days after the termination of the course. To expand the evaluations' transparency, we will undertake these actions:

1) almost all lecturers and supervisors draw up project forms that describe the advancements of students; 2) after finishing an assignment, lecturers plan a personal feedback moment; 3) other lecturers send an individual report with remarks on the exercise to the students. Although this feedback suffices according to the guidelines of the examination regulations (i.e. the communication of the results within 40 days after the course was terminated), the study programme's evaluation showed that students still think the evaluations' transparency is rather insufficient. A possible reason is that engineering exercises sometimes aren't terminated at the end of the semester, but only after 6 weeks in most bachelor study years. Students, however, specifically ask to receive feedback faster after completion of the exercises in these courses. In that way, students can integrate the study experience quicker in new assignments.

Because of the larger amount of flexible, individual programmes, it is not simple to organize an examination schedule without exams overlapping. These overlaps can occur with regular timetables and examination schedules. The choice to follow courses that overlap in the timetable is the student's responsibility. It means that he/she will not participate in the classes of one of these courses. On that note: taking two exams at the same time is also impossible. Deviations from the examination schedule can occur, but only under prior conditions.