

3ME – EDUCATIONAL VISION –

EDUCATIONAL MISSION

The 3mE faculty educates skilled, flexible, independent and responsible academic engineers¹ in the field of mechanical engineering and maritime and clinical technology to equip them with knowledge of measurement & control technology, mechanics & materials science and thermodynamics & fluid mechanics. In addition to providing students with this fundamental basic knowledge, the educational emphasis is on acquiring skills, understanding and insight. That is why students learn to apply the knowledge they have acquired and create constructive designs for so-called applications² such as maritime technology, human-machine interaction and biomechanical and biomedical technology. Students also learn to set personal goals and become aware of their own development so that they can learn to reflect on how far they have come. On one hand this enables them to continue to develop as a person and an engineer (lifelong learning) and, on the other hand, develop into the people they want to be (engineer identity). These goals are noted in the final attainment levels of the faculty programme.

VISION

The education provided by the 3mE faculty is based on Biesta's principles (qualification, socialisation and subjectification)³.

In the Bachelor's degree programmes the emphasis is on the transition from secondary school pupil to an independent, responsible and motivated student and on acquiring academic skills. In the Master's degree programme students are trained to be young professionals in a specific application and while the focus is on depth, there is also space for width.

At curriculum level, the faculty offers coherent, logically structured and attractive programmes which offer sufficient choice and space/flexibility for students' ambitions and areas of interest. At subject level the faculty offers didactically adequate education in which learning objectives, learning formats and assessment are all properly aligned.

The faculty wants to take its social responsibility and therefore links with social themes/challenges and integrates these into the education it provides.

Students are able to develop into academic professionals and/or scientists and learn to collaborate in multidisciplinary and interdisciplinary teams in relation to other students as well as with companies, organisations, hospitals, etc. In the process the focus is on fundamental knowledge, new developments and finding solutions and insights. Students gain experience with a variety of engineering roles⁴.

Technical knowledge and engineering skills are supported or reinforced by acquiring transferable and interpersonal skills in a challenging learning environment so that students have the tools to adapt in line with changing circumstances both during their studies and later on in life. Students are supported in this endeavour by mentors and the e-portfolio.

The campus fulfils the role of a learning community and a melting pot for learning, working, research and innovation. In addition to qualifications and new knowledge acquisition, a community also contributes to

¹ Also concerns clinical technologists

² 3mE faculty's multi-year policy plan

³ Het beeld van de leraar: Over wijsheid en virtuositeit in onderwijs en onderwijzen. Biesta 2011.

⁴ 4TU document, engineer of the future, 2020

community building (socialisation) and identity formation (subjectivisation) and therefore has an important social and connecting function in addition to learning. The focus of the education provided by the faculty is on on-campus learning so that students are motivated and challenged on the campus to apply the knowledge they have learned in interaction with others and in relation to the environment and to produce innovative solutions and insights and demonstrate skills.

The faculty acknowledges the role of both the teaching staff and the students in the continuous development of the curriculum as a joint responsibility. The quality of the programme and the connection with current and, above all, future social areas of concern as well, are developed on the basis of continuous consultation with the student population.

The faculty wants the student population to be a reflection of the pre-university population and also wants the social and international backgrounds to be recognisable in the student population.

FURTHER DEVELOPMENT OF THE EDUCATIONAL VISION

SOCIAL CONTEXT

Society is facing huge challenges relating to health and welfare, energy, security and lifestyle, and technology can help with these challenges, both now and in the future.

The faculty wants to take its social responsibility and play an active role by the raising awareness among students in education and by preparing them for such themes. That is why the themes referred to are going to be firmly integrated into the teaching, in subjects, working groups and the multidisciplinary and interdisciplinary project-based subjects.

THE EMPLOYMENT MARKET⁵

In order for engineers to continue fulfilling a role in terms of social changes and challenges it is important that they not only acquire technical knowledge and skills, but also have so-called interpersonal and transferable skills. Students are taught to look critically at themselves in interaction with their environments. The skills which are important for 3mE engineers have been worked out for each programme.

DIDACTIC CONCEPT

The faculty's chosen didactic concept is that of the reflective engineer⁶. This means that the focus is on students who learn to take responsibility for their own learning and development towards becoming engineers (self-leadership) in dialogue with developments in society. Challenge based learning (CBL) is therefore integrated into the didactic concept of the reflective engineer. First and foremost students acquire (medical and) technical knowledge and engineering skills in relation to an application (qualification). There is also space for students' own objectives, on the grounds of which they can make choices during the programme within the framework of their own development, ambitions and interests so that they can develop into young professionals with their own identity (engineer's identity).

In (multidisciplinary and interdisciplinary) project-based education the students learn to apply knowledge, create technical designs, collaborate in teams and find solutions for social problems.

Students are encouraged to work as engineers on solutions which are the result of a system vision meaning, in other words, that the reflective engineer looks for solutions from target groups which contribute to more sustainable operations and the responsible functioning of a product. This is known as the Conceive Design Implement Operate (CDIO)⁷ concept.

PROGRAMME

Before students start their university programme they will have⁸ thought long and hard about what they want to study and will have decided whether it suits them and links up with whatever is substantively required of them. The first year is aimed at transitioning from pupils to students and at feeling comfortable with the programme. In the second year students will have become independent and can take⁹ more responsibility for their own studies and development. During the third year students will be prepared for their further development towards a Master's degree programme. The Bachelor's degree programme is organised and structured in such a way that it can be completed within the nominal three years. In order to do justice to the programme's coherence and structure the faculty expects students to devote the necessary time to their studies and to complete their studies chronologically.

⁵ Effecten van technologisering op de arbeidsmarkt, SER, 2019.

⁶ 'The reflective engineer is able to look critically at himself in dialogue with society, understand the world and find solutions for future challenges and make choices and take responsibility'.

⁷ The CDIO initiative is an educational framework that places the emphasis on technical principles in the context of conceiving, designing, implementing and using systems and products from the real world.

⁸ In the case of the clinical technology programme, students are selected.

⁹ Wherever the pronouns he or him are used this should also be taken to mean she/her, they/them etc.

The Bachelor's degree programme includes design education and a broad range of technical and mathematical subjects, which provide students with fundamental knowledge of the subject. There is also a focus on (inter)personal skills, such as feedback and reflection, communication and cooperation skills. In the project-based subjects the students can use their knowledge, create technical designs and collaborate in teams. The elements referred to are brought together in the Bachelor End Project (BEP) in which students work in teams to resolve a technical assignment. The students' development is supervised by mentors and the e-portfolio.

Minors are available so that students can also broaden their development, and an honours degree programme is available for gifted students.

In the Master's degree programme students start with goal-setting and formulating a learning question (curriculum). The students then learn to reflect during the programme on their development in order to achieve their goal. All Master's degree programmes have the same structure and level of difficulty in the second year and consist in the first phase of more in-depth optional subjects, internships, or an interdisciplinary project. The students' choice is determined by the students themselves by formulating and reflecting on their own learning objective. In the final project phase students will also cooperate and learn more and more. On one hand this links up more effectively with the faculty's didactic concept while, on the other hand, the students find this more stimulating and enjoyable.

Lastly, students will learn to do independent research during their final project and, as fully-fledged engineers, contribute new knowledge and innovations to the field. They will also present their e-portfolios and demonstrate that they have become broadly educated engineers who are able to make their own choices and engage in lifelong learning. In addition to being a student assistance tool, the e-portfolio is also used as a programmatic assessment tool in order to provide a justification for the student's personal development path.

The idea behind the Bachelor's degree programmes offered by the 3mE faculty is to train students for the Master's degree programmes. The fact that the Bachelor's degree programmes are interrelated means it is also possible to transfer to a Master's degree programme outside the faculty or university, or to find a job.

Students are also expected to treat their fellow students, lecturers and staff members with respect and to ensure that there is space for dialogue later in an open and safe learning environment.

LEARNING ENVIRONMENT

The faculty offers students a safe, challenging and ultimately sustainable learning environment in which learning takes place in interaction with others and the surroundings, with a focus on the learning climate¹⁰.

The faculty distinguishes between two learning environments:

- the physical learning environment on the campus;
- the online learning environment for synchronous or asynchronous education.

The campus has a key function in terms of learning (qualification) and identity formation (subjectivisation), and also has an important role to play in community building (socialisation). That is why the faculty's point of departure is that students should attend education on the campus.

In those instances in which hybrid education is offered to students, this will have to take place within a powerful learning environment. To that end we are going to continue to develop hybrid education so that large groups of students can follow lessons live from their homes which are also challenging and activating.

The faculty has a system in place to monitor the quality of teaching and assessment, as laid down in the quality assurance/assessment policy.

LEARNING PROCESS

¹⁰ The faculty bases its approach on the guideline entitled 'Success and Failure in Higher Education: Building Resilience in Students', edited by Tessa Leesen Alkeline van Lenning as well as the 'graduating journey' project.

The faculty's aim is to support students in their development and facilitate their learning process. Brightspace helps students learn and plan because the structure is aligned to the subject, as a result of which it is clear to students what is expected from them and what they have to learn and achieve in order to pass.

Students are supported in their development by mentors (mentorship) and they learn to take control of their own programme (autonomy). As the programme progresses the level of mentorship will decrease and the level of autonomy will increase, and the e-portfolio supports students in this process. The re-calibrations of the various curricula will involve an assessment per programme of how the e-portfolio can provide the best possible support to students in their development.

Throughout the learning process the faculty wants to take more account of the various backgrounds of the students to make it feasible and enjoyable for any student to attend a 3mE programme (diversity + inclusivity). In this context the faculty wants to start exploring the use of pre-education pathways in order to train a (culturally and socio-economically) broader diversity of engineers.

LECTURERS AND ORGANISATION

The faculty regards the teaching support staff as professionals who are able to translate the faculty's mission and vision into challenging and motivating education. As regards the academic staff, the faculty's aim is equal appreciation for teaching and research. Our lecturers have a University Teaching Qualification certificate (BKO) and are also continually updated on the latest teaching-related developments so that the education they provide is, and remains, up to date and links up with the needs of students and society. They are supported in their work by teaching advisors. The faculty assumes that both its lecturers and its support staff are intrinsically motivated and accept the responsibility of providing high-quality education.

EDUCATION IN CO-CREATION

Society, businesses, organisations, education and research influence each other continuously, meaning that students can constantly be supplied with state-of-the-art knowledge which they can learn to use in real-life cases at companies, hospitals, TU research, organisations and government bodies. As a result, students not only learn to use engineering and professional skills, but also to experience what it is like to work as an engineer (including research). They also learn to think about future solutions and encourage businesses to look at things from a different perspective. This is how education can influence change.

The faculty also actively maintains a network of alumni to give it a good insight into the fit between its academic engineers and the employment market.

