

KU LEUVEN



Master of Bioscience Engineering: Human Health Engineering

Faculty of Bioscience Engineering

KU Leuven. Inspiring the outstanding.

Master of Bioscience Engineering: Human Health Engineering

Our interdisciplinary **Master of Bioscience Engineering: Human Health Engineering** programme (HHE) is dedicated to training the next generation of experts in human health engineering. As a student, you will develop a unique profile that transcends traditional disciplinary boundaries and combines knowledge of the biology of the healthy human body and mind with engineering skills. Upon graduating, you will have the knowledge and skills to develop novel creative technologies aimed at improving our quality of life.

Your studies will focus on a wide range of real-life applications in the areas intelligent bio-environments, nutrition, sports and activity, preventive health monitoring, safety and quality of life. Through practical exercises, project work and close contact with companies, you will develop in-demand skills for both industry-based and research-based careers.



HHE is embedded in the research activities of four KU Leuven faculties, all of which have a strong expertise in the different aspects of human health engineering. The **Faculty of Bioscience Engineering** commands state-of-the-art expertise in developing technology for complex biological systems, including human applications. The **Faculty of Engineering Science** conducts world-leading research in hardware development as well as signal analysis methods for real-time monitoring of human body functions. The **Faculty of Medicine**, with its research hospital, offers world-class research expertise on human health applications, while the **Faculty of Kinesiology and Rehabilitation Sciences** conducts state-of-the-art experimental and theoretical research in the fields of sports, injury prevention and rehabilitation. HHE collaborates closely with experts from these faculties and links up with **IMEC**, a former KU Leuven spin-off and a world leader in nanoelectronics and sensor development.

Discover KU Leuven

Situated in Belgium, in the heart of Western Europe, KU Leuven has been a centre of learning for nearly six centuries. Today, it is Belgium's largest and highest-ranked university and, founded in 1425, one of the oldest and most renowned universities in Europe. As a leading European research university and co-founder of the League of European Research Universities (LERU), KU Leuven offers a wide variety of international master's programmes, all supported by high-quality, innovative, interdisciplinary research.

Since its founding, KU Leuven has been based in the city that shares its name. Leuven is a pleasant, safe and bustling student town, where centuries-rich history meets cutting-edge science. The university also offers degree programmes at campuses in 11 Belgian cities, including Brussels, Ghent and Antwerp.

HHE educational vision

HHE offers a unique programme and educational vision focusing on technology for healthy humans. While many programmes in biomedical technology are offered in Belgium and abroad, HHE is the **first and only** programme offered in English that applies the unique combination of human physiology and engineering in a broad range of areas for healthy humans.

Knowledge of **physiology and psychology of the healthy human** is a key component of the programme. (See the 'Programme' section for a full description of courses.) HHE's educational vision is centred around a commitment to teach students to develop technology using insight in the workings of human physiological systems as a starting point. The programme **progresses from biology onward to technology**, not vice versa as is often the case in most engineering programmes. In this way, the programme aims at developing new technology in a more efficient way, meeting the high expectations of users. HHE graduates are trained to understand and speak the language of the different areas integrated within the programme.

Thanks in large part to the ongoing revolution in sensor technology and computing power, HHE graduates' knowledge and skills constitute an **ever-growing added value**. The programme mainly focuses on the application domains: quality of life, sports and active life, nutrition, intelligent environments and preventive health monitoring. Concrete examples of technology developed by our HHE researchers include: condition monitoring of football players (in collaboration with AC Milan), drowsiness monitoring for car drivers (in collaboration with Bosch), heart rate monitoring via intelligent t-shirts (in collaboration with Adidas), design of optimised safety helmets for bicyclists (in collaboration with Lazer Sport), stress monitoring (in collaboration with BioRICS), etc.

Admission requirements

HHE is designed for highly motivated students with a solid background in exact sciences and a keen interest in developing technology for healthy humans, with a particular emphasis on improving human health. HHE is open to any applicant holding an academic bachelor's degree in engineering (bioscience engineering, biomedical engineering, civil engineering, electrical engineering, or any equivalent engineering degree), and to applicants holding other bachelor's or master's degrees encompassing thorough coursework in at least (i) mathematics and statistics and (ii) biology and physiology. Students may be required to take strengthening elective courses to fill any gaps in educational background. Approval of the individual application and a proposal of a strengthening course package are given on a case-by-case basis by the programme's steering committee. Applicants must be able to demonstrate a good command of both spoken and written English.

Profile

- You have basic scientific and technological knowledge and skills in the following areas: biology, chemistry, ecosystems, mathematics-physics, engineering;
- You are able to relate the knowledge gained in the bachelor's programme in a critical way to an application domain of your choice;
- You are trained to address problems both independently and in a team in a goal-oriented way (inventiveness, creativity, self motivation and team spirit);
- You can recognise domain-related problems and frame them in a social, ethical and economic context;
- You already have basic knowledge of and affinity with bio-engineering related technical courses such as biological basic knowledge, physical transport phenomena, mechanics of solids, electronic instrumentation, etc.;
- You have acquired a solid basis in mathematics and physics and are able to use this in more application-oriented courses such as the engineering courses mentioned above, numerical analysis of biosystems and statistical data processing;
- You have mastered the basic principles of control systems-theoretic reasoning and are able to apply this to complex, technical and biological systems and their interaction processes.





Programme

The HHE curriculum is comprised of 120 ECTS (four semesters). The programme is organised into a two-module major, a minor, a master's thesis and elective courses.

MAJOR

The **first module** (20 ECTS) contains five courses that will allow you to gain insight in the working of the different **physiological systems of the human body** as well as in the **psychology of the healthy human**. These courses are taught by lecturers from the Faculty of Medicine, the Faculty of Kinesiology and Rehabilitation Sciences and the Faculty of Psychology and Educational Sciences.

The **second module** (41 ECTS) consists of eight engineering courses that are taught by lecturers from the Faculty of Bioscience Engineering and the Faculty of Engineering Science. In this module, you are challenged to gain insight in **technology** and apply your technological knowledge to solve real-life problems in a creative way via practical exercises and project work.

The major also includes a broadening course on religion and society (3 ECTS).

MINOR, MASTER'S THESIS AND ELECTIVES

The 20-ECTS **minor** is comprised of courses chosen to either strengthen your major or to broaden your expertise in another domain.

In the **master's thesis** (30 ECTS), you will further develop your 'hands-on' experience and learn to solve problems using the acquired skills.

The curriculum is rounded off with 6 ECTS of **elective courses** aimed at broadening your academic education. These credits may also be used to take strengthening elective courses to fill any gaps in educational background.

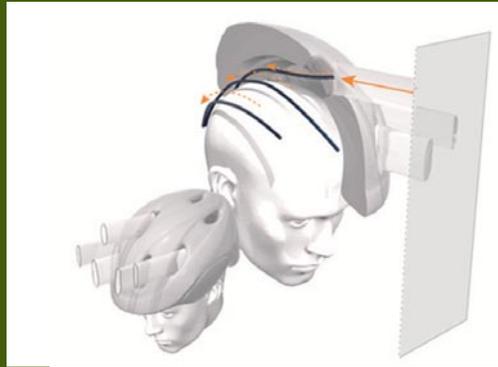
This programme structure allows for a high degree of personalisation, which, in turn, ensures the best possible match for your interests or future career ambitions.

MASTER OF BIOSCIENCE ENGINEERING: HUMAN HEALTH ENGINEERING		120 ECTS
COURSES		ECTS
MAJOR		64
Body & Mind		20
• Human System Physiology		5
• Functional Anatomy of the Human Locomotor System		3
• Nutrition and Metabolism		4
• Exercise Physiology		4
• Health Psychology part 2: Biopsychological Interactions		4
Engineering		41
• Integration of Biological Responses in Process Management		6
• Identification and Control of Biotechnical Processes		6
• Optics, Lasers and Acoustics		5
• Biofluidics		3
• Project Work Biosystems Engineering		6
• Human Health Data Processing		6
• Biomedical Measurements and Stimulation		6
• Biosensors and Bioelectronics		3
MINOR		20
ELECTIVE COURSES		6
MASTER'S THESIS		30

For detailed descriptions of this programme's courses and for the course timetable, please consult www.kuleuven.be/ma/hhe

Studying abroad

Are you looking to broaden your horizons? There are ample opportunities to conduct part of your master's thesis research at various partner institutions abroad. In addition, European residents can undertake their master's thesis research at a European or other partner university within the framework of the Erasmus+ programme.



In several courses you will be challenged to develop technology for real-life applications in interaction with international companies and world-renowned universities. These experiences will acquaint you with the international dimension of human health engineering.

 www.biw.kuleuven.be/hhe

Career prospects

As an HHE graduate, your polyvalent skill set will make you widely employable in the labour market, both within your own specialisation and in other sectors. You will be equipped to take on scientific, technical, organisational and commercial-technical roles in many sectors. In addition, as a bio-engineer, you will rapidly evolve from supporting positions to management positions and this in different activities (research, production and service, marketing, etc.), according to your interests and goals.

As an HHE expert, your contribution will be essential in numerous industrial sectors, including all professional domains linked to the well-being, health and performance of healthy humans in interaction with their environment. This includes the pharmaceutical industry, the clothing and fashion industry, sport technology companies, medical companies, companies active in sleep comfort, helmet producers, producers of furniture, the transport industry (such as cars, buses, trains, and airplanes), etc. In all of these business activities, the products of the future must be tuned to a better quality of life for humans. Furthermore, the ageing population is in urgent need of more and better preventative healthcare services, including automated systems for monitoring and support. As a bio-engineer specialised in living systems, you will have the potential to create added value in all of these areas, with special attention to the central place of the healthy human in the development of sustainable technology.

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Learn more

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This brochure provides the most complete and accurate information available concerning this master's programme offered at KU Leuven. However, amendments to the composition of this programme may be approved at any time. Consequently, KU Leuven is in no way legally bound by the information provided in this brochure. The most recent information on all our academic programmes can be consulted at www.kuleuven.be/coursecatalogue

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**ASSOCIATIE
KU LEUVEN**