TWENTE GRADUATE SCHOOL
MIRA GRADUATE SCHOOL

UNIVERSITY OF TWENTE.
DISCLAIMER
Although this brochure was compiled with the utmost care, no rights can be derived from its contents.
The health care sector is undergoing major changes. There is a growing demand for health care in our (aging) society, while at the same time the system has to remain affordable and accessible for everyone. It is imperative for care to become more efficient, more focused on self-reliance, and less institutionalized. There is a need for improved and faster diagnoses, for better understanding of diseases, and for a focus on prevention. Treatment and rehabilitation should be patient-specific and where possible in a home situation or with primary care. New health care technologies will have implications for governments, health care providers, health insurance companies and the health care users. The multidisciplinary approach enables Biomedical Engineering to contribute to these various aspects of health care.

Fundamental biomedical science and advanced technologies are the catalysts for innovation in health care. Within MIRA, the entire circle is addressed: fundamental Biomedical Science flows into applied research, which in turn flows into clinical practice, which ultimately serves to generate the questions that stimulate fundamental and applied research. This unique scientific approach encourages the successful application of fundamental concepts and enables the rapid translation of scientific and technological innovations to the patient. But the reverse is also true: current medical problems lie at the very heart of new technology-based diagnoses and therapies. MIRA works closely with hospitals, the business community and governmental organizations, with the aim of securing its leading position in Europe.

MIRA Graduate School builds upon the Biomedical Engineering educational programme, with contributions from technological and social science research groups. Within MIRA, research is grouped into three strategic research orientations (SROs): Tissue Regeneration, Imaging and Diagnostics and Neural and Motor Systems. The programme’s content is intrinsically in conformity with, and is a veritable showcase for, the motto of the University of Twente: High Tech, Human Touch.

Prof.dr.ir. Bart Koopman
Leader MIRA Graduate School at Twente Graduate School

FUNDAMENTAL BIOMEDICAL SCIENCE AND ADVANCED TECHNOLOGIES ARE THE CATALYSTS FOR INNOVATION IN HEALTH CARE
TWENTE GRADUATE SCHOOL

TWENTE GRADUATE SCHOOL OFFERS HIGH-QUALITY EDUCATIONAL PROGRAMMES BASED ON SUBJECTS CLOSELY RELATED TO THE WORK OF THE UNIVERSITY’S RESEARCH INSTITUTES, AND TAUGHT AND SUPERVISED BY EXPERT RESEARCHERS FROM THESE SAME INSTITUTES. IT OFFERS AN INCREASING VARIETY OF INTEGRATED MASTER’S AND PHD PROGRAMMES FOR OUTSTANDING GRADUATE STUDENTS WHO ARE KEEN TO PURSUE A CAREER IN SCIENTIFIC RESEARCH.

MIRA

INSTITUTE FOR BIOMEDICAL TECHNOLOGY AND TECHNICAL MEDICINE

MIRA is a trend-setting and rapidly growing research institute in the field of Biomedical Technology and Technical Medicine and ranks eighteenth on the list of the largest research and knowledge centres in the Netherlands.

Technological science is the catalyst for innovation in health care. MIRA combines fundamental and applied research with clinical practice. This unique scientific path stimulates the successful application of fundamental concepts and enables the health care sector to rapidly introduce new treatments. MIRA works in close cooperation with hospitals, the business community and governmental organizations with the aim of securing its leading position in Europe.

Our multidisciplinary approach enables us to make innovative contributions across a wide spectrum within the health care sector. MIRA’s research will result in the development of new techniques to repair damaged tissue, such as bone and skin. It helps to create drugs that are targeted in their effects and enables physicians to diagnose more effectively by using improved imaging techniques. Furthermore, MIRA offers patient-focused solutions in rehabilitation technology.

TGS PROGRAMMES

TGS programmes are established in collaboration between the University’s faculties and research institutes. Their broad selection of compulsory, discipline-related and optional courses enable students to specialize in a research area they are interested in, while broadening their perspective on the societal context of technology and research. All these aspects are integrated into the Twente Graduate School, which aims to be a springboard for research talent.

MANPOWER

275 - 300 RESEARCHERS

INTERNATIONAL EMPLOYEES

33%

TURNOVER

€ 22 MILLION IN 2012

NUMBER OF SPIN-OFFS

9 SPIN-OFF COMPANIES, 5 LICENCE AGREEMENTS, 16 NEW PATENT APPLICATIONS SINCE THE ESTABLISHMENT IN 2009

SOME LIAISONS

MAX PLANCK INSTITUTE, IMPERIAL COLLEGE, UNIVERSITY HOSPITAL BASEL, SIEMENS, JOHNSON & JOHNSON, UMC NIJMEGEN, UMC GRONINGEN, UMC UTRECHT, MEDISCH SPECTRUM TWENTE, ROESSINGH RESEARCH AND DEVELOPMENT
MIRA’s research can be grouped into three Strategic Research Orientations (SROs):

<table>
<thead>
<tr>
<th>STRATEGIC RESEARCH ORIENTATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMAGING &amp; DIAGNOSTICS</td>
</tr>
<tr>
<td>WE PICTURE AND INTERPRET THE PROCESSES IN CELLS AND ORGANISMS. THE TECHNIQUES THAT WE HAVE DEVELOPED TO IMAGE A PATIENT’S BODY ARE BASED ON ACOUSTICS, PHOTOACOUSTICS, ULTRASOUND AND BIOMAGNETISM. NOT ONLY ARE OUR NEW METHODS EXTREMELY CLEAR AND EXACT, THEY ALSO SIGNIFICANTLY REDUCE THE BURDEN ON THE BODY, SINCE OPERATIONS AND INJECTIONS ARE NO LONGER REQUIRED.</td>
</tr>
<tr>
<td>TISSUE REGENERATION</td>
</tr>
<tr>
<td>WE DEVELOP TECHNOLOGIES THAT RESTORE THE FUNCTION OF DISEASED ORGANS AND DAMAGED TISSUES, SUCH AS BONE, CARTILAGE, BLOOD VESSELS AND PANCREAS. INNOVATIVE METHODS STIMULATE THE BODY TO GENERATE NEW TISSUE BY ITSELF, EXACTLY WHERE NEEDED. OUR CLEAR INSIGHTS INTO THE WAY IN WHICH CLINICS TREAT THEIR PATIENTS, SUPPORTS OUR WORK OF DEVELOPING SCIENTIFIC BREAKTHROUGHS THAT CAN BE APPLIED IN PRACTICE. IN THIS WAY, WE SPEED PATIENT RECOVERY.</td>
</tr>
<tr>
<td>NEURAL &amp; MOTOR SYSTEMS</td>
</tr>
<tr>
<td>WE EXAMINE THE INTERPLAY BETWEEN THE BRAIN, NERVES, MUSCLES AND THE SKELETON. OUR WORK FOCUSES ON ACTUALLY RESTORING THE FUNCTION OF THE NERVOUS AND MOTOR SYSTEMS. WE ARE OFTEN DRIVEN BY SPECIFIC CLINICAL QUESTIONS FROM THE HEALTH CARE SECTOR. WE ACT ON THE VARIOUS ANATOMIC LEVELS, RANGING FROM CELLS AND TISSUES TO THE COMPLETE ORGANISM, AND AIM TO DEVELOP NOVEL EQUIPMENT.</td>
</tr>
</tbody>
</table>
The MIRA graduate programme for Biomedical Engineering covers the full breadth of research and education activities in biomedical sciences and engineering at the University of Twente. This area of research is the focus of the MIRA Institute for Biomedical Technology and Technical Medicine, one of the spearhead research institutes of the University of Twente.

MIRA research is organized in three strategic research orientations, actively stimulating cooperation in the constituent disciplines of Physics, Chemistry, Biomedical Technology, Biology, Electrical Engineering, Mechanical Engineering, Medicine, Health Sciences and Mathematics. The three orientations are Imaging and Diagnostics, Tissue Regeneration, and Neural and Motor Systems. Currently, seventeen research groups participate within the Institute. The research within the strategic orientations focuses on the following areas:

### Imaging & Diagnostics
- Molecular Biophysics
- Medical Cell Biophysics
- Biomedical Photonic Imaging
- Acoustic and Ultrasound Imaging
- Neuroimaging and Statistical Image Analysis
- Health Technology Assessment

### Tissue Regeneration
- Biomaterials Science and Technology
- Controlled Drug Delivery
- Tissue Engineering
- Developmental Bioengineering

### Neural & Motor Systems
- Biomechanical Engineering
- Biomedical Signals and Systems
- Clinical Neurophysiology
- Minimally Invasive Surgery and Robotics
- Applied Analysis and Mathematical Physics
- Robotics and Mechatronics

**Programme Leader:**
Prof.Dr.ir. Bart Koopman

**Contact Person:**
J.M.Jukes@utwente.nl

**Related UT Master’s Programmes:**
Biomedical Engineering*
The Strategic Research Orientations are composed of full-time research chairs that are grounded in their respective science or engineering disciplines. All themes also have clinical chairs, which facilitate the cooperation with medical specialists, aiming to develop technologies that can be translated to both the clinic and the patient. The clinicians also translate clinical practice into research questions.

MIRA also pays considerable attention to health technology assessment, ethics, and the societal embedding of health care technologies; groups from the Faculty of Social Sciences and the School of Management and Governance at the University are integral members of the Institute.

Finally, in keeping with the tradition of the University of Twente as an entrepreneurial university, MIRA has employed several entrepreneurial professors. MIRA actively pursues a vibrant start-up policy and facilitates the creation of, and collaboration with, small and medium-sized companies and large industrial enterprises. MIRA places a strong emphasis on teaching and training. For undergraduate students, we have a vibrant, new Dutch BSc and English MSc Biomedical Engineering programme, integrated in the Research Institute. Approximately 125 of MIRA’s staff are PhD candidates or post-doctoral fellows.

The TGS MIRA graduate programme for Biomedical Engineering will form the framework for our graduate education activities at the Master’s and PhD levels.

**PHD COURSES:**
For the PhD courses an individualized programme will be agreed upon, possibly with contributions from different research schools or postgraduate programs. Examples are the postgraduate programme in regenerative medicine, courses from the Dutch Institute of Systems and Control or from the research school of Behavioural and Cognitive Sciences.

* Possibilities for students from Chemical Engineering, Electrical Engineering and Mechanical Engineering, as well as from Applied Physics and Technical Medicine do exist. Students from affiliated Bachelor’s programmes, like Advanced Technology, may continue their study in the Master’s programme Biomedical Engineering, possibly after taking a so-called homologation programme. More information on admission to the Master’s in BME is found at www.utwente.nl/master/bme.

**WE STRIVE TO TRANSLATE FUNDAMENTAL AND APPLIED RESEARCH INTO CLINICAL PRACTICE**
ADMISSION REQUIREMENTS AND ENROLMENT

THERE ARE TWO WAYS TO ENROL INTO A TGS PROGRAMME. YOU CAN START A MASTER’S DEGREE PROGRAMME AT THE UNIVERSITY OF TWENTE OR YOU CAN START A PHD PROGRAMME IF YOU HAVE ALREADY COMPLETED A MASTER’S PROGRAMME AT THE UNIVERSITY OF TWENTE OR ELSEWHERE.

ARE YOU CURRENTLY A BACHELOR’S STUDENT?

BSc
• You have already obtained your Bachelor’s degree

MSc
• Two-year programme with discipline related courses, 120 credits
• Opportunity to start an integrated MSc/PhD programme in the second year

PhD
• PhD research
• Deepening, broadening, academic skills and career development courses, 30 credits

ARE YOU CURRENTLY A MASTER’S STUDENT?

MSc
• You have already obtained your Master’s degree

PhD
• PhD research
• Deepening, broadening, academic skills and career development courses, 30 credits

If you are currently a Bachelor’s student or if you have recently obtained your Bachelor’s degree, and if you are interested in pursuing a PhD through one of the integrated research programmes TGS offers, please have a look at our Master’s programmes.

To be admitted to a Twente Graduate School programme, you must have achieved excellent results in your Bachelor’s degree and have good research skills. Also, you must have gained admission to a relevant Master’s programme. The Twente Graduate School programmes are particularly concentrated on research. Talented students can write their PhD proposal as part of their Master’s degree programme. For more information about the Master’s programmes, the admission requirements, and the tuition fee, please visit our website at: www.utwente.nl/master

If you have successfully attained a Master’s degree, you may enter a PhD programme at the Twente Graduate School. PhD candidates may either apply for a PhD position available at one of the research groups or try to obtain their funding themselves.

VACANCIES
Unlike in many other countries, most PhD students in the Netherlands are paid employees, often working directly for the university. Research projects are defined by the head of the research group, who subsequently recruits graduate students to carry out these projects. In case a PhD position is offered in the research field of your choice, you are kindly invited to apply to such a vacancy. Vacancies for PhD positions at the University of Twente, including those connected to the Twente Graduate School, are published on the vacancies website at: www.utwente.nl/vacancies
OWN FUNDING
You may also enter a Twente Graduate School programme as a PhD student with your own funding or with an international scholarship. In that case, research projects are initiated on the basis of proposals submitted by graduate students as part of their application procedure. A professor in a relevant field has to express interest in the candidate and the proposed line of research. Before a proposed research plan is taken into consideration, it must be clear that the candidate intends to submit an application for a secured funding scholarship. Please note that the University of Twente is not in a position to offer fellowships or similar funding for PhD students, other than the vacancies mentioned above.

ADDITIONAL INFORMATION
For more information about the Twente Graduate School, please visit the TGS website at: www.utwente.nl/tgs.

For more information about the career development courses visit www.utwente.nl/ctd/en/phd