MINOR BIOROBOTICS

IN THE MODULE BIOROBOTICS, YOU WILL DESIGN AND BUILD A ROBOT FROM SCRATCH THAT CAN MAKE A DIFFERENCE IN THE LIVES OF PEOPLE WITH A MOVEMENT DISABILITY. YOU WILL USE NOTHING BUT THE ELECTRICAL SIGNALS FROM YOUR MUSCLES TO CONTROL THE ROBOT FROM A DISTANCE, MAKING IT OBEY YOUR EVERY COMMAND. IN DOING SO, YOU WILL COMBINE MECHANICAL, ELECTRICAL, BIOMEDICAL, CONTROL AND SOFTWARE ENGINEERING, AND WILL DESIGN A TRULY HIGH-TECH, HUMAN-TOUCH SYSTEM.

WHAT IS A HTHT MINOR?
A HTHT-minor fits within the UT profile: High Tech, Human Touch. The minor is offered in English and accessible for both national and international students. The goal of the HTHT-minor is to illuminate specific societal themes for which the UT develops High Tech Human Touch solutions. These solutions are created by conducting high-quality research. Both the form and the content of the minors are High Tech Human Touch (multidisciplinary) and are profiling for the student.

The UT offers most HTHT-minors in a coherent package of 2 (30 EC). There are also HTHT minors of 15 EC that do not belong to a package. You can choose one of these minors and combine this with one minor of a package. If possible, you can even choose 2 minors from different packages.

MINOR INFORMATION
Patients with movement disabilities find it difficult to participate in daily life. Robots have the potential to assist them when needed, and in this module we will design and build a robot that does just that.

Robotics is the branch of technology that deals with the design, fabrication, operation, and application of robots, as well as the computer systems needed for their control, sensory feedback, and information processing. These technologies allow automated machines to take the place of humans in dangerous environments or manufacturing processes, or resemble humans in appearance, behavior, or cognition. Worldwide scientific and industrial demand for skilled engineers with advanced systems and control knowledge of robotic systems that can apply this knowledge in biomedical or general high-tech systems is strongly increasing.

The elective module BioRobotics applies high-tech systems & control knowledge of robotic design to the
biomedical interaction with the human body, and thereby combines a vast number of disciplines. During the module, a robot has to be built that interacts with the human body to improve the quality of life of a person with a movement disorder. To make it even more realistic and relevant, and to enhance your motivation and participation, such an individual will be invited to participate in the project and to grade the final results.

Much of the interdisciplinary material and skills required in this module will be new to the most of you, but with the help of an experienced and motivated staff the results your fellow students have been achieving since 2013 have been truly amazing.

In the project, you will have to design and build a robot, including all the mechanical, electronic and software components, and you will learn to:

- Design a functional robot from scratch.
- Integrate knowledge from multiple disciplines such as mechanical, electrical, biomedical, software and control engineering.
- Make mechatronic simulation models of your design.
- Obtain and process biologic signals for usage in steering the robot.

The project is chosen to maximize the application of the knowledge gained in the following courses in the module:

- Control of Robotic Systems
- Multibody Dynamics & Control
- Biological Signal Analysis
- Embedded Programming

**BioRobotics Design Project**

You will have to analyze the needs of the person, build the mechanical construction of the robot using laser-cut plywood, select motors and construction elements, program the signal analysis and robot control methods in C++ in an embedded controller, and analyse the performance and acceptability of the device when interacting with humans.

**Control of Robotic Systems**

You will learn to control a mechatronic system that interacts with the human body using mechanical and electrical components, with a focus on the practical application of knowledge.

**Multibody Dynamics & Control**

You will learn how systems of one and two rigid bodies behave in 1D and 2D, and how these systems can be controlled. You will create a model of your robotic design concepts to predict, and if needed modify, the control behavior before they are build.

**Biological Signal Analysis**

You will learn to convert non-linear and noisy neurophysiological signals to useable control inputs for the robots. Special attention is given to the time-frequency relation of signals, to be able to relate them to the control of robotic systems.

**Embedded Programming**

You will learn to program an embedded system to measure and process the neurophysiological signals and convert this to a control signal for your robot that uses the integrated sensors and electrical motors.

**MORE INFORMATION**

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For more information about this minor and for general information about minors: www.utwente.nl/majorminor/