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 THE ELECTRICAL SIGNALS FROM YOUR MUSCLES TO CONTROL THE ROBOT, MAKING IT OBEY YOUR COMMANDS. BY COMBINING MECHANICAL, ELECTRICAL, BIOMEDICAL, CONTROL AND SOFTWARE ENGINEERING, IT TRULY IS A HTHT 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.

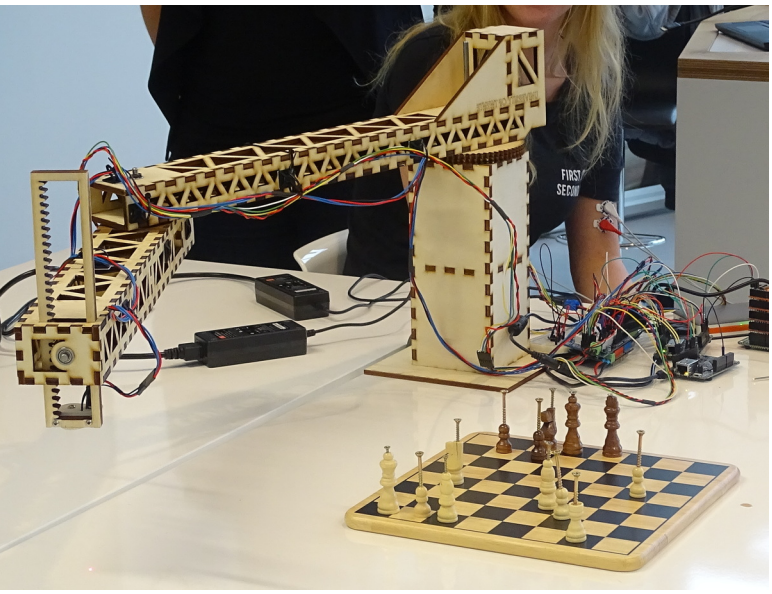
The UT offers most HTHT-minors in a coherent package of 2 (30 EC). There are also HTHT minors of 15 EC that do not belong to a package. You can choose one of these minors and combine this with one minor of a package. If possible, you can even choose 2 minors from different packages.

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



"The most enjoyable design module we have experienced!"

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 consulted during the design process.

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, electrical 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
- Robot Kinematics
- Biomedical Signal Analysis
- Programming of Embedded Systems

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 analyze 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.

Robot Kinematics

The students learn to apply geometrical concepts from Lie group theory to serial robotic manipulators; in this case to design and analyze planar robot kinematics. Derivation of direct forwards kinematics and forward/backward differential kinematics allow you to implement high-level position control in your project's embedded control solution.

Biomedical Signal Analysis

You will learn to convert noisy neurophysiological signals to usable 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.

Programming of Embedded Systems

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:
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