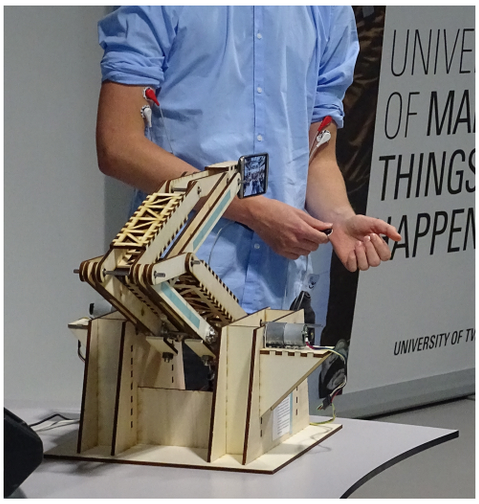
WWW.UTWENTE.NL/MINOR

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.

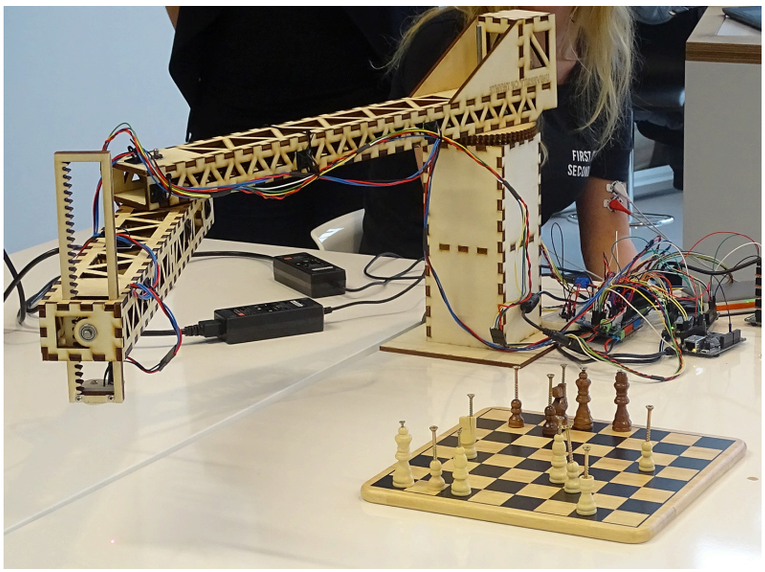
MINOR INFORMATION

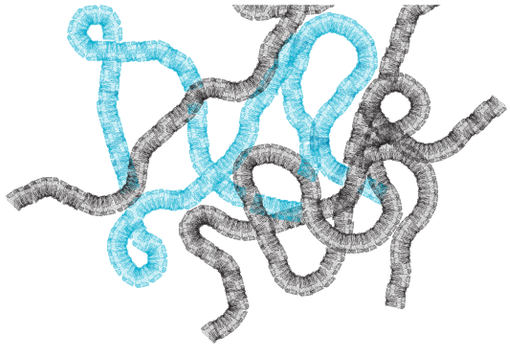
People with movement disabilities find it difficult to participate in daily life. Robots have the potential to assist them when needed. In this module we will design and build a robot that does just that.

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 of robotic design to interact with a biomedical system - the human body, thereby

UNIVERSITY OF TWENTE.





The most enjoyable design module we have experienced!

incorporating many disciplines. In the module, your student team will design, build, and test a robot that interacts with the human body to improve the quality of life of a person with a movement disorder.

Much of the interdisciplinary material and skills required in this module will be new to most of you, but with the help of an experienced and motivated staff, your fellow students have been achieving truly amazing results since 2013. You may be surprised what you can accomplish in just 10 weeks!

Courses

The courses given in this module are:

- BioRobotics Design Project
- 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, program the signal analysis and robot control methods with Python in an embedded controller and analyze the performance and acceptability of the device when interacting with humans.
This project is designed to maximize your application of the knowledge gained in the following four courses within the module.

Control of Robotic Systems (CRS)

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 (RKI)

You will 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 (BSA)

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 (PES)

You will learn to program a microcontroller in the Python language 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.

*AT, AP, ME and EE students

Together with the educational programs, we have determined that AT (who have done Systems and Control in M6), AP, ME and EE students have to follow an alternative version of CRS. These alternative versions go into some more advanced topics (see Osiris course catalog) to avoid overlap with the standard curriculum.

MORE INFORMATION

Minor coordinator:
Dr. Rai MacLean
Horst HC W103
T: 053 489 7699
E: M.K.MacLean@utwente.nl

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