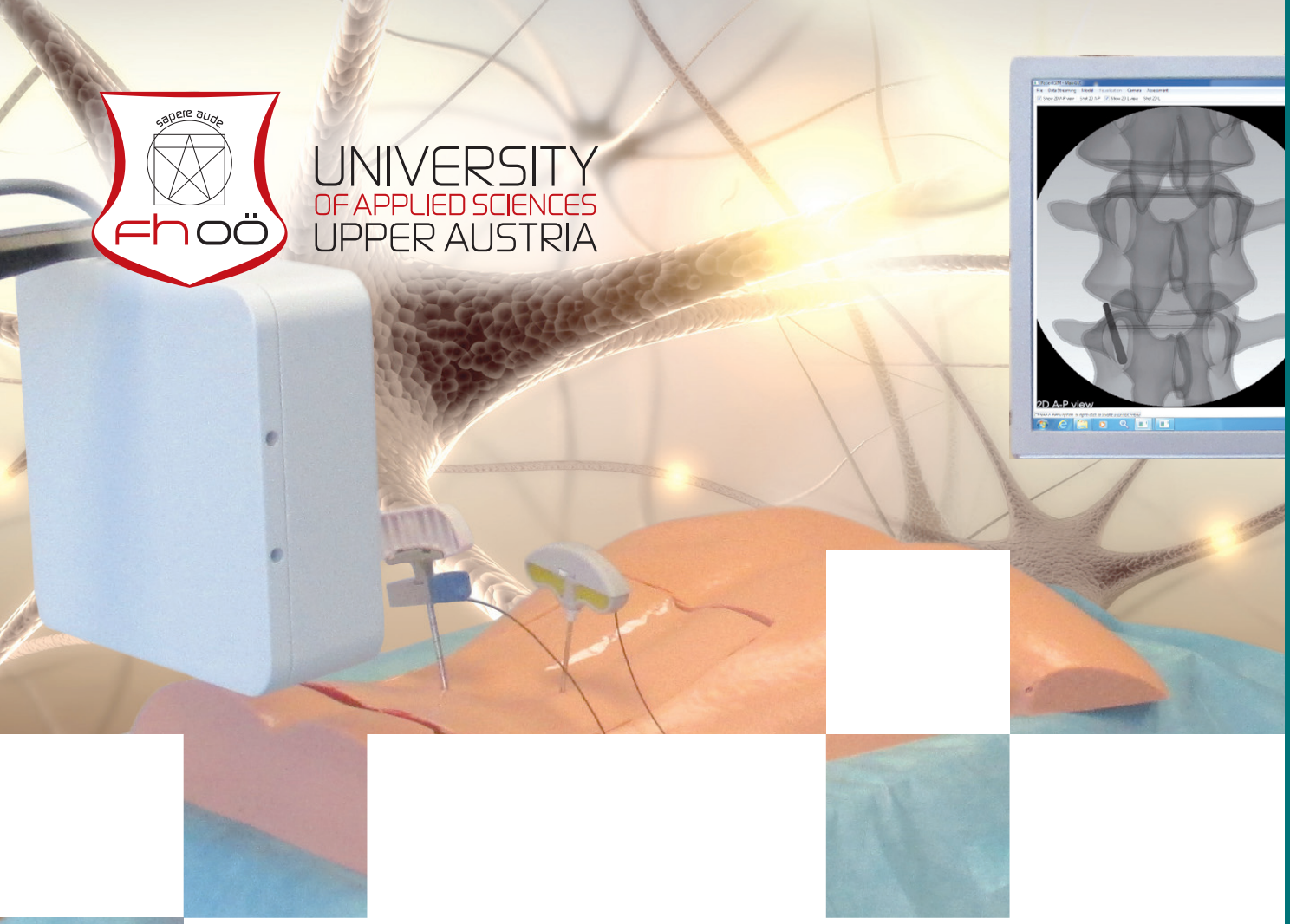


UNIVERSITY
OF APPLIED SCIENCES
UPPER AUSTRIA

www.fh-ooe.at/winter-school-mt

Winter School in Medical Engineering 2024

Key Areas: Prosthetics, Materials and Medical Simulations

5 - 9 February 2024

University of Applied Sciences Upper Austria
School of Medical Engineering and Applied Social Sciences Linz/Austria

Aim

higher

Winter School in Medical Engineering 2024

Key Areas: Prosthetics, Materials and Medical Simulations

Thanks to significant advances in technology, prostheses are no longer bulky things mainly designed to replace the shape of an absent limb. Special material technologies such as lithography can reduce the weight of a prosthesis by more than 90%. Moreover, the implementation of particular sensor technologies significantly improves the accuracy and precision of any movement. Finally, embedding easily programmable microcontrollers allows a prosthesis and its wearer to realize a large variety of complex movement patterns. Nowadays, prostheses are high-tech devices which foster the independence and autonomy of their wearers, thereby significantly improving their quality of life.
However, before prostheses can be fitted and worn, a variety of simulations and tests have to be performed to ensure correct functioning.
The Department of Medical Engineering and International Office of the University of Applied Sciences Upper Austria in Linz are pleased to welcome you to our annual Winter School offering you a 5-day program of lectures, workshops, laboratory and cultural activities. We sincerely hope that you enjoy your stay with us as well as find some time to discover Linz – it is the third largest city in Austria and the capital of the Province of Upper Austria.

For further information and application please visit:
www.fh-ooe.at/winter-school-mt

FH-Prof. DI Dr. Martin Zauner MSc
Head of Department of Medical Engineering

Mag. Iwona Hunstorfer
Head of International Office

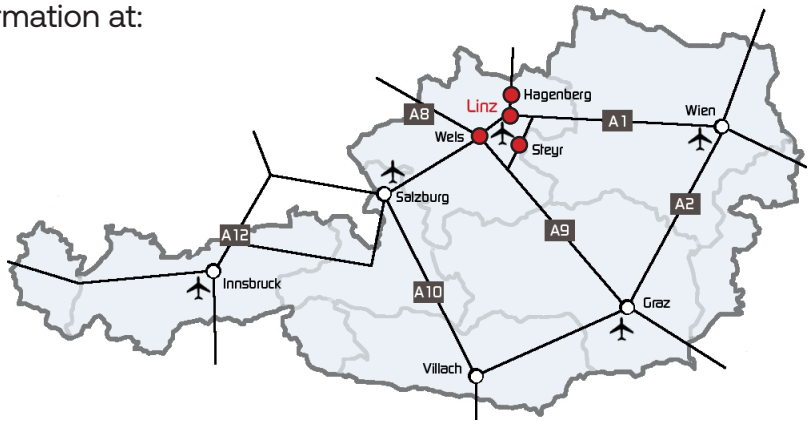
Aim → **higher**

University of Applied Sciences Upper Austria (FH Upper Austria)

The University of Applied Sciences Upper Austria is the largest research-intensive university of applied sciences in Austria and is an integral part of the tertiary education system. The organization is defined by the requirements of regional employment and research needs. Four locations in Upper Austria´s central area offer innovative and interdisciplinary academic degrees, each with a different focus.

- School of Informatics, Communications and Media
  Hagenberg Campus
- School of Medical Engineering and Applied Social Sciences
  Linz Campus
- School of Business and Management
  Steyr Campus
- School of Engineering
  Wels Campus

You will find more information at:
www.fh-ooe.com



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School of Medical Engineering and Applied Social Sciences

The focus in Linz is Medical Engineering and Applied Social Sciences. Our aim is to prepare students for the leadership positions of the future. Because our programs are designed around a common theme, the synergy effects are obvious: more knowledge and a multitude of partner organizations, such as the Austrian Red Cross, leading charities and numerous human services organizations and companies such as Otto Bock.

All degree programs combine comprehensive training with practice. The School of Medical Engineering and Applied Social Sciences offers study programs at undergraduate (bachelor´s) and graduate (master´s) level.

Medical Engineering combines medicine and medical device technology, and prepares students to bridge the gap as Medical Engineers.
The course of study for a degree in **Social Work** trains students to advise and counsel people in distress, and enables graduates to plan and organize the helping process.
Human Services Management focuses on the business skills, graduates need to work in organizations in the social services field. The program in **Public Management** combines business administration, accounting, controlling, business information systems, law, and public finance.

Preliminary Program

→ Monday, 5 February 2024

9:00	Introduction FH Upper Austria and Medical Engineering
9: 15	Organizational Matters
9:45	Coffee and FH Campus Tour
11:30	Additive Manufacturing and Sample Analysis (Technical Part)
12:45	Lunch Break - Sandwich Day
13:30	Additive Manufacturing and Sample Analysis (Lab Tour)
17:00	Welcome Dinner

→ Tuesday, 6 February 2024

9:00	Inertial Measurement Units for Prosthetics (Lecture)
12:30	Lunch Break - Pizza Day
13:30	Healthy Spine - Are you sitting correctly? (Workshop)

→ Wednesday, 7 February 2024

9:00	Core Facilities and Research Areas of the Center of Technological Innovation in Medicine (TIMed CENTER)
9:45	Break
10:00	High-tech Limb-Prostheses (Lecture)
12:30	Lunch Break - Schnitzel Day
13:30	Visualisation of EMG-Signals which control Myo-Prostheses (Workshop)
15:30	Break
16:00	Guided Tour „Kepler Universitätsklinikum Med Campus III“ Hybrid operation laboratory for heart surgery with robot based imaging

→ Thursday, 8 February 2024

8:00	Myoelectric Control of Hand-Prostheses (Lecture)
10: 15	Break
10:30	Myoelectric Control of Hand-Prostheses (Laboratory)
11:30	Lunch Break - Sandwich Day
12:30	Myoelectric Control of Hand-Prostheses (Laboratory)
15:00	Free afternoon

→ Friday, 9 February 2024

8:00	Leave from FH Upper Austria
9:00	Guided tour: voestalpine Stahlwelt including plant tour
12:00	Bus to city centre
13:00	Guided Tour: Linz Brewery
14:30	Farewell late lunch at the brewery restaurant
16:30	Good bye and free time

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Lectures and Workshops

→ Monday, 5 February 2024

Dr. Andreas Karner, Dr. Armin Hochreiner
University of Applied Sciences Upper Austria (Austria)

Additive Manufacturing and Sample Analysis (Lecture + Workshop)

The modern laboratories in Linz offer a variety of techniques for nanolithography as well as microscopical sample characterization. In our laboratories, you will get a deeper understanding of techniques like multiphoton lithography, mask less lithography, fluorescence microscopy, atomic force microscopy and spectroscopy. Moreover, the laboratory is equipped with a cell culture, equipment for molecular protein and genome analysis as well as advanced equipment for surface characterization. We are using these techniques in several projects applying them for example to analyze aggregation of thrombocytes, for biomimetic arteria etc. Recently, we offer trainee positions in several practical courses and experimental bachelor and master works.

→ Tuesday, 6 February 2024

Dr. Thomas Haslwanter
University of Applied Sciences Upper Austria (Austria)

Inertial Measurement Units for Prosthetics (Lecture)
Healthy Spine - Are you sitting correctly? (Workshop)

Position and orientation of human subjects (and also of objects like your smartphone) can be measured in different ways: one can use accelerometers, gyroscopes, magnetometers, optical systems, or a number of other devices. Unfortunately, cheap devices are often rather inaccurate, so that a combination of them has to be used in order to achieve reliable results.
In this course we will first introduce the basic measurement devices used for human movement recordings. Then the mathematical foundations required to measure position and orientation will be covered, such as rotation matrices and quaternions.
The accompanying workshop will provide a hands-on experience of working with data from inertial measurement units. Depending on the background of the participants, data will be analyzed using Python and/or Matlab. To ensure success in the analysis, routines will be provided that implement the basic analysis steps for the evaluation of the recorded data.

Lectures and Workshops

→ Wednesday, 7 February 2024

DI (FH) Thomas Kern
Director Center of Excellence, University of Applied Sciences Upper Austria (Austria)

Core Facilities and Research Areas of the Center of Technological Innovation in Medicine (TIMed CENTER) (Lecture)

The Center for Technological Innovation in Medicine (TIMed Center) bundles the strengths of the four FH Upper Austria faculties in Hagenberg, Linz, Wels and Steyr, to realize a new, internationally visible main hub in the Medical Valley Upper Austria in the form of an interfaculty center for the development of interdisciplinary solutions to technical issues in the life sciences (medicine, biomedicine, biology, biochemistry, molecular biology, biophysics and bioinformatics). In addition, the TIMed Center forces a technology-centered and science-based academic education in Upper Austria.

Dr. Hubert Egger
University of Applied Sciences Upper Austria (Austria)

High-tech Limb-Prostheses (Lecture)

A prosthesis is an artificial device that replaces a missing body part, which may be lost through trauma, disease or congenital conditions. Prosthetic amputee rehabilitation is primarily coordinated by a prosthetist and an inter-disciplinary team of health care. Students attending the Winter School acquire theoretical knowledge with respect to basics in Anatomy, Physiology, Biomechanics, Electrical Engineering and Electronic Systems. The course contributes to improved knowledge and understanding in pro-sthetic limbs.

Visualisation of EMG-Signals which control Myo-Prostheses (Workshop)

Based on the theory EMG-Signals will be picked up by surface electrodes from the student's forearm. Signals are then gained by amplifiers developed at the University of Applied Sciences to make them visible and audible. Additional signal-processing make the signals suitable to control artificial limbs performed in the Lab.

Lectures and Workshops

→ Thursday, 8 February 2024

Dr. Andreas Schrempf
University of Applied Sciences Upper Austria (Austria)

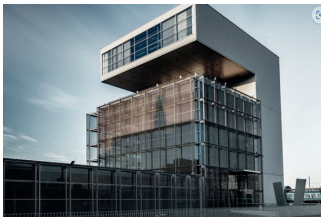
Myoelectric Control of Hand-Prostheses (Lecture + Workshop)

Within this course students will learn to implement a control strategy for a hand prosthesis by means of forearm muscle contractions. In the lecture the basic principles will be discussed and then in turn realized in the laboratory. The implementation of the control strategy will be programmed in C and tested first with the help of Matlab/Simulink. Once the control algorithm works as expected, the implementation will be transferred to the hardware, where students can test their implemented control strategy with their own EMG-signals to operate a real hand prosthesis. The learning outcome of that course includes the following topics: basic filtering techniques for EMG signals, implementation of a control strategy in C by means of a state machine, testing in Matlab/Simulink, transferring a C code to a target hardware platform, acquiring EMG-signals from the forearm, controlling a real hand prosthesis.

Cultural Day - Technics and Brewery Adventure

→ Friday, 9 February 2024

voestalpine Stahlwelt - including plant tour



The steel works at the Linz location is one of the cleanest and most innovative in the world. Many steelmakers make this claim about their production facilities, but only few of them let others look beyond the perimeter fences. We go one step further: After visiting the exhibition in the voestalpine Stahlwelt, you will be permitted to take a tour of some production lines, including a blast furnace and the production facilities of Automotive Components. This will allow you to experience the entire production process from ore to the car door.

Linz Brewery

Linz beer has an eventful history that has been driven by great visions and ambition from the very beginning. It began in 1638 with the opening of the city brewery on the Brauhauslände - today known to all Linzers as the „Untere Donaulände“. Come with us to visit today‘s Linz Brewery, which was not reopened until 2022, in the former Linz Tobacco Factory.
After the tour we invite you to lunch in the adjoining restaurant. Cheers!