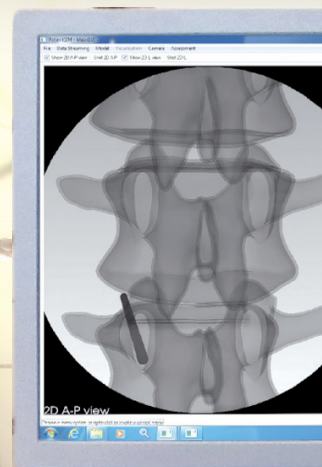




UNIVERSITY
OF APPLIED SCIENCES
UPPER AUSTRIA



Winter School in Medical Engineering 2025

Key Areas:
Medical Simulations, Telemonitoring,
Bioprinting and Materials

3 - 7 February 2025

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

Aim

→ **higher**

Winter School in Medical Engineering 2025

Key Areas: Medical Simulations, Telemonitoring, Bioprinting and Materials

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

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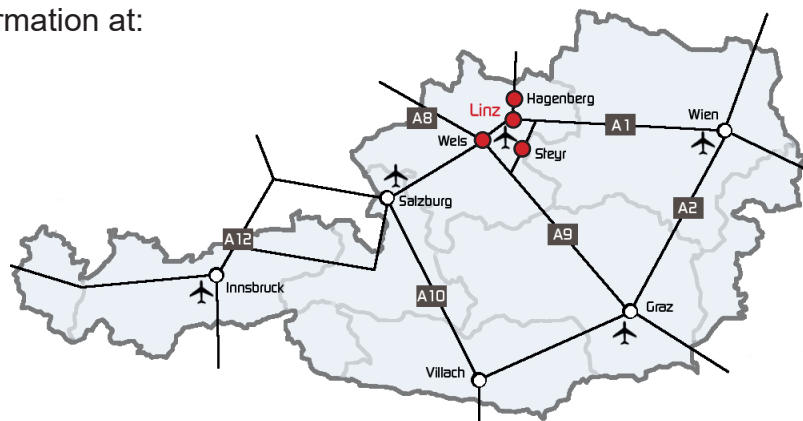
University of Applied Sciences Upper Austria (FH Upper Austria)



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 (BA/MA) combines medicine and medical device technology and prepares students to bridge the gap as Medical Engineers.

Social Work (BA/MA) trains students to advice and counsel people in distress and enables graduates to plan and organize the helping process.

Social-, Public- and Nonprofit-Management (BA) is a business degree program that is geared towards the realities of the social and health, the public and the non-profit sectors.

Applied Technologies for Medical Diagnostics (MA) covers a new professional area at the intersection of engineering, natural sciences and technology-oriented health professions, neatly filling the gap between development engineering and the application of medical devices.

Leading Transformation for Impact Organizations (MA) combines sustainability and digitalization with leadership and organizational change.

Managing Nonprofit and Public Services (MA) offers an industry-specific general management education with a focus on non-profit organizations and public institutions.

Aim

—————→ **higher**

Preliminary Program

→ Monday, 3 February 2025

- 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, 4 February 2025

- 9:00 Bioprinting (Lecture)
 - 12:30 Lunch Break - Pizza Day
 - 13:30 Bioprinting (Workshop)
-

→ Wednesday, 5 February 2025

- 9:00 Core Facilities and Research Areas of the Center of Technological Innovation in Medicine (TIMed CENTER)
 - 9:45 Break
 - 10:00 Telemonitoring - Biosignal Detection and Transmission (Workshop)
 - 12:30 Lunch Break - Schnitzel Day
 - 13:30 Telemonitoring - Biosignal Detection and Transmission (Workshop)
 - 15:30 Break
 - 16:00 Guided Tour „Kepler Universitätsklinikum Med Campus“
-

→ Thursday, 6 February 2025

- 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, 7 February 2025

- 8:00 Leave from FH Upper Austria
 - 9:00 Social Activity - in progress
 - 14:30 Farewell late lunch
 - 16:30 Good bye and free time
-



Lectures and Workshops

→ Monday, 3 February 2025

Dr. Andreas Karner

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, maskless 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 arteries etc. Recently, we offer trainee positions in several practical courses and experimental bachelor and master works.

→ Tuesday, 4 February 2025

Dr. Armin Hochreiner

University of Applied Sciences Upper Austria (Austria)

Bioprinting (Lecture + Workshop)

Bioprinting is currently a constantly growing area of research. The areas of application are very diverse. 3D printing in medicine - such as 3D bioprinting for tissue engineering - has huge potential. Printed structures with biological material can, for example, help to better study cell growth in the laboratory. In the future, complex organs could be printed with this modern technology. Also supporting the reduction of animal experiments is one major goal.

How can you build a simple bioprinter? This is what the Department of Medical Technology is presenting as part of the Winter School. Gain your first experience with creating and printing bioink.

As optical measurement systems play a growing role in 3D printing and in medicine a short excursion into optical measurement technology rounds off the program.

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Lectures and Workshops

→ **Wednesday, 5 February 2025**

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. Robert Merwa

University of Applied Sciences Upper Austria (Austria)

Monitor your own ECG - how does it work? (Lecture + Workshop)

The human heart is a complex, hollow, muscular organ about the size of a fist that beats rhythmically up to 100,000 times a day and thereby supplies our body with vital oxygen and nutrients. The activity of the heart muscle is measured using electrodes on the body - this is called an electrocardiogram (ECG). The analysis of the ECG is indispensable for monitoring and controlling the state of health, for the early diagnosis of diseases, and for the performance diagnosis of athletes. For telemedical monitoring, modern ECG devices are equipped with WiFi modules so that data can be transmitted and evaluated in real time.

The first part of the workshop includes a short introduction to the structure of the heart and an overview of current measurement methods. The hardware of a programmable portable ECG module, which is used to record and forward the ECG signal, is also explained.

In the practical part, this portable ECG module is programmed to record ECG data using electrodes on the body and forward it via WiFi.

The ECG data can then be received on a PC using a special module and displayed in real time on the monitor.



Lectures and Workshops

→ **Thursday, 6 February 2025**

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.

Aim

→ **higher**