FH UPPER AUSTRIA
LINZ CAMPUS

Winter School in Medical Engineering 2020

Key Areas: Prosthetics, Materials and Medical Simulations

03 - 07 February 2020

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

Preliminary Programme

www.fh-ooe.at/mt-en

UNIVERSITY OF APPLIED SCIENCES UPPER AUSTRIA

Winter School in Medical Engineering 2020

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 Winter School offering you a 5-day programme 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

University of Applied Sciences Upper Austria (FH Upper Austria)

The University of Applied Sciences Upper Austria is the largest university of applied sciences in Austria and is an integral part of the tertiary education system. The organisation 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.

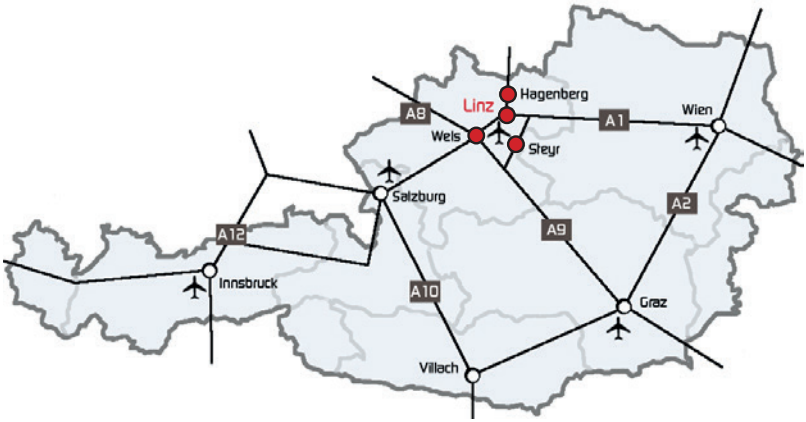
>> School of Informatics, Communications and Media
Hagenberg Campus

>> School of Medical Engineering and Applied Social Sciences
Linz Campus

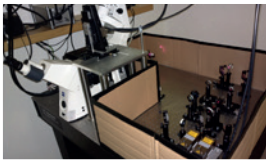
>> School of Management
Steyr Campus

>> School of Engineering
Wels Campus

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



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 programmes 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 programmes combine comprehensive training with practice. The School of Medical Engineering and Applied Social Sciences offers study programmes 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 programme in **Public Management** combines business administration, accounting, controlling, business information systems, law, and public finance.

Preliminary Programme

Please note that small changes may still occur!

Monday, 03 February 2020

9:00	Introduction FH Upper Austria and Medical Engineering ⇨ SR A-104/105
9: 15	Organizational Matters ⇨ SR A-104/105
9:45	Coffee and FH Campus Tour
11:00	Additive Manufacturing and Sample Analysis (Technical Part) ⇨ SR A-107
12:30	Lunch Break - Sandwich Day ⇨ SR A-104/105
13:30	Additive Manufacturing and Sample Analysis (Lab Tour) ⇨ L3, L5, L7
17:30	Welcome Dinner

Tuesday, 04 February 2020

9:00	Inertial Measurement Units for Prosthetics (Lecture) ⇨ SR A-107
12:30	Lunch Break - Pizza Day ⇨ SR A-104/105
13:30	Healthy Spine - Are you sitting correctly? (Workshop) ⇨ L1
15:30	Break
16:00	Guided Tour „Kepler Universitätsklinikum Med Campus III“ Hybrid operation laboratory for heart surgery with robot based imaging

Wednesday, 05 February 2020

9:00	Core Facilities and Research Areas of the Center of Technological Innovation in Medicine (TIMed CENTER) ⇨ SR A-107
9:30	Break
9:45	Guest Lecture ⇨ SR A-107
11: 15	Break
11:30	High-tech Limb-Prostheses (Lecture) ⇨ SR A-107
13:00	Lunch Break - Schnitzel Day ⇨ SR A-104/105
13:45	Visualisation of EMG-Signals which control Myo-Prostheses (Workshop) ⇨ L1

Thursday, 06 February 2020

9:00	Myoelectric Control of Hand-Prostheses (Lecture) ⇨ L1
11: 15	Break
11:30	Myoelectric Control of Hand-Prostheses (Laboratory) ⇨ L1
12:30	Lunch Break - Sandwich Day ⇨ SR A-104/105
13:30	Myoelectric Control of Hand-Prostheses (Laboratory) ⇨ L1
15:45	Break
16:30	“Ars Electronica Center“ “Deep Space 8K - Best of Ars Electronica“ Highlight Guided Tour

Friday, 07 February 2020

9:00	Bus pick-up from FH Upper Austria
9:30	Archery - Sports Centre Breitenstein
12:00	Lunch
14:30	Guided Tour: Brewery Freistadt
16:30	Bus trip back to Linz
17:00	Farewell Dinner

Lectures and Workshops

Monday, 03 February 2020

FH-Prof. DI Dr. Birgit Plochberger, FH-Prof. DI Dr. Jaroslaw Jacak, FH-Assistenzprof. Dr. Armin Hochreiner
University of Applied Sciences Upper Austria (Austria)

Additive Manufactoring 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 position in several practical courses and experimental bachelor and master works.

Tuesday, 04 February 2020

Prof. 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 analysed 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.

Wednesday, 05 February 2020

DI (FH) Thomas Kern
Director Center of Excellence (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 inter-faculty center for the development of interdisciplinary solutions to technical issues in the life sciences (medicine, biomedicine, biology, biochemistry, molecular biology, biophysics and and bioinformatics). In addition, the Timed Center forces a technology-centered and science-based academic education in Upper Austria.

Prof. 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 prosthetic 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, 06 February 2020

Prof. 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 Events - Technics, Sports and Brewery Adventure

Wednesday, 05 February 2020

Ars Electronica Center

The Ars Electronica Center is a place of inquiry and discovery, experimentation and exploration, a place that has taken the world of tomorrow as its stage, and that assembles and presents influences from many different ways of thinking and of seeing things. Join us for a “highlight guided tour” and before that experience the “Deep Space 8K” - a 16 by 9 meters wall and 16 by 9 meters floor projection, laser tracking and 3-D animations. An all-out upgrade of the venue’s technical infrastructure of the Deep Space will enable audiences to enjoy projections at 8K resolution and thus worlds of imagery at a never-before-achieved level of quality.

Friday, 07 February 2020

Archery Sports Centre Breitenstein / Kirchschlag

Kirchschlag is a small municipality in the northern part of Upper Austria. Spend with us a few hours there with delicious food in a typical Austrian restaurant and join us for maybe your first hunting adventure at the Archery Sports Center Breitenstein. Practised archers can embark on the course immediately and independently and beginners can do so with rental bows after a short introduction. You will shoot at different 3D animals. In the last few years, the Bogensportzentrum Breitenstein has established itself as one of the largest archery centres in the German-speaking area. With a 150-m²-sized archery hall open 24/7, three different 3D courses with more than 68 3D targets

Brewery Freistadt

Freistadt’s history can not be imagined without the brewing community. The Habsburg Duke Rudolf IV granted the brewing license to the citizens of Freistadt in 1363. At first beer was brewed in different houses, but after some time they joined forces by creating the first early form of today’s inns. Little by little the citizens united into larger brewing groups, finally there was only one wheatbeer and one brown beer brewery left in the city. In 1746 the township acquired all brewing licenses. They founded the “brewing community” (Braucommune), in which 149 house owners from the old town have been and still are the owners of the brewery together. The brewing community proved its importance for the city outwardly by building a common brewery, which was inaugurated in 1777 and has been the place of business for the city’s most important company. Find out more during our guided tour and join us for a beer tasting.

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UNIVERSITY OF APPLIED SCIENCES UPPER AUSTRIA

Forschung LAND OBERÖSTERREICH