

# UAS Technikum Wien

## COURSE GUIDE SS2024 COURSES OFFERED IN ENGLISH



Please note:

Incoming students have the possibility to combine courses from different study programs. The number of places available for Incoming students in each course may vary or be limited to a certain number. We recommend to choose courses from no more than a maximum of 2 different study programs to avoid overlaps.

**Please be aware, that incoming students are obliged to generate at least 9 ECTS from the Campus International.**

At the beginning of each semester an Orientation Week is held for all Incoming students as well as for all Double Degree students.

The Orientation Week takes usually place in the 2nd week of September resp. 2nd week of February.

**Please take into consideration that this course guide may be subject to change!**

Last update: 19.10.23

# OVERVIEW OF COURSES OFFERED ENTIRELY IN ENGLISH

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# GLOSSARY AND ABBREVIATIONS

Term	Abbreviation	Description
Laboratory	LAB	Application and practical exercises in small groups.
Seminar	SE	High extent of interactivity in teaching and by a sequence of theoretical inputs, case studies, exercises and discussions in small groups.
Integrated Teaching	ILV	Instruction is given by a sequence of theoretical teaching and practical exercises in (small) groups.
Distance Learning	FUV/FL/DL	The courses are divided into the on-campus phase and distance/online learning. During the on-campus phase the presence of the students is obligatory. During these phase the students have the introduction courses, attend the examinations or give their presentations in front of the class.  During the online-phase the students have to work on the course contents via moodle courses, where they have to hand in assignments, take part in forum discussions and/or read study letters and literature. During the online-phase the students do not have to be presence at the university.
Lecture	VO	Mediation of new knowledge by the means of frontal teaching.
Exercise	UE	Reduced transfer of new knowledge and practical strengthening in (small) groups.

Study Program	Abbreviation (in German)
<b>Bachelor</b>	
Biomedical Engineering	BBE
Renewable Energies	BEE
Electronic Engineering	BEL
Electronics and Business	BEW
Information and Communication Systems and Services	BIC
Computer Science	BIF
International Business & Engineering	BIW
Mechanical Engineering	BMB
Mechatronics/Robotics	BMR
Smart Homes and Assistive Technologies	BSA
Human Factors and Sports	BHF

Business Informatics	BWI
<b>Master</b>	
Medical Engineering & eHealth	MME
Data Science	MDS
AI Engineering	MAI
Renewable Urban Energy Systems	MEE
Embedded Systems	MES
Health Care and Rehabilitation Technology	MGR
IT Security	MCS
Power Electronics	MLE
Industrial Engineering & Business	MIB
Mechanical Engineering	MMB
Robotics Engineering	MRE
Software Engineering	MSE
Sports Equipment Technology	MST
Tissues Engineering and Regenerative Medicine	MTE
Internet of Things and Smart Systems	MIO
Innovation and Technology Management	MTM
Environmental Management and Ecotoxicology	MUT
Information Systems Management	MWI



# Campus International (ECI)

## Service and object-oriented Algorithms in Robotics

<b>Degree programme</b>	ECI
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	6.00
<b>Incoming places</b>	Limited

<b>Course description</b>	The discusses main concepts of robot programming including different concepts for software development. This includes programming, concepts and methods, in particular ROS (robot operating system as a stadnardized framework for personal robots).
<b>Teaching methods</b>	This course is based on theory and exercises with mobile robot simulations/ robots. - Lecture (theory, methods, math and algorithms) - Exercises in small groups: problem solving with robot simulation/ real robots
<b>Learning outcome</b>	After passing this course successfully students are able to ... - explain components and operating modes of robots - define and differentiate between navigation with plans, localisation and trajectory planning - control mobile robots by applying behaviour methods for direct sensor-actor coupling - explain principles and applications of machine vision - clarify concepts of probabilistic robotics and apply respective algorithms - explain and design machine learning applications for object detection
<b>Course contents</b>	- Short outline of basic robot programming conceptsmased on a robot's kinematics, actors sensors and control concepts - C++ - ROS
<b>Prerequisites</b>	Mandatory: - Sensor technology - Basic programming skills, in particular in C - Sensor technology
<b>Assessment Methods</b>	- 70% final exam

	- 30% exercises
<b>Recommended Reading and Material</b>	- <a href="http://wiki.ros.org/ROS/Tutorials">http://wiki.ros.org/ROS/Tutorials</a> - Bishop, C.M.; Pattern Recognition and Machine Learning, 2006
<b>Attendance</b>	Attendance is mandatory in this course, only 20% of absence is tolerated. In case you miss more than 20% of the class you lose the first try in the exam.
<b>Comments</b>	

## Data Ethics and Open Data

<b>Degree programme</b>	ECI
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	6.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Open data is accessible public data that people, companies and organisations can use and process. The benefit of Open Data is not only the publication itself, but especially its duplication and reuse as new applications and solutions can increase transparency, promote innovation and encourage community engagement. The extensive use of increasingly more data in general also requires the consideration of complex moral and ethical subjects related to data to support good solutions and responsible handling. The course will be divided into two subject areas: Lectures on Data Ethics will provide the opportunity to learn about the ethical impacts of data and related topics (privacy, transparency, surveillance etc.). In lectures on Open Data students will learn about Open Data from a technical viewpoint and work on an Open Data application.
<b>Teaching methods</b>	The course consists of - lectures combined with discussions - project work and exercises
<b>Learning outcome</b>	After passing this course successfully students are able to ... <ul style="list-style-type: none"> <li>- analyse and work with Open Data</li> <li>- determine different fields of Open Data applications</li> <li>- assess the quality of different Open Data sources</li> <li>- value the importance of responsible handling of data in different areas of application</li> </ul>

	<ul style="list-style-type: none"> <li>- discuss domain-related data ethics</li> <li>- analyse and describe the challenges and risks of an intelligent machine learning system (AI)</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Open Data applications in different fields: Healthcare, finance, Smart Cities etc.</li> <li>- Open Data formats</li> <li>- Open Data policies</li> <li>- Project: analysing and processing open data</li> <li>- Data Ethics</li> <li>- Data Privacy, Transparency</li> </ul>
<b>Prerequisites</b>	Basic Knowledge in Web Technologies, Database Systems, and Data Management
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Participation in discussions and presentation (Data Ethics)</li> <li>- Project results and project presentation (Open Data)</li> </ul>
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Ethics Advisory Group (2018): Ethics Advisory Group Report 2018</li> <li>- European Union (2017): Open Data Maturity in Europe 2017</li> <li>- Specific papers related to domains</li> <li>- Open data Web sites and catalogues (e.g. <a href="https://open.wien.gv.at">https://open.wien.gv.at</a>)</li> </ul>
<b>Attendance</b>	Attendance is mandatory
<b>Comments</b>	Course Details will be provided in Moodle.

## Mobile Robotics

<b>Degree programme</b>	ECI
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	6.00
<b>Incoming places</b>	Limited

<b>Course description</b>	The course provides an introduction to the basics in mobile robotics with regard to the main components of mobile robots. The students achieve a basic understanding of methods to control mobile robots and implement behaviours as well as methods for direct sensor-actor coupling. The knowledge learned is first applied in a simulation environment and finally tested on a real robot.
<b>Teaching methods</b>	The learning content is explained using PDF slides and Jupyter

	notebooks. Afterwards, the students are divided into groups and carry out a project independently with the help of the lecturer.
<b>Learning outcome</b>	After passing this course successfully students are able to ... - explain components and operating modes of robots - define and differentiate between navigation with plans, localisation and trajectory planning - control mobile robots by applying behaviour methods for direct sensor-actor coupling - apply basic knowledge ROS
<b>Course contents</b>	- Introduction to Mobile Robotics - Develop ROS nodes for robot applications
<b>Prerequisites</b>	Mandatory: Programming in C++ and/or Python; Basic Linux Skills (there are warm-up slides)   Recommended: Computer Vision Basics
<b>Assessment Methods</b>	- Homework: 20% - Moodle Quizzes: 20% - Moodle Forum: 5% - Projekt: 55%
<b>Recommended Reading and Material</b>	- O'Kane: A Gentle Introduction To ROS, 2.1.6, 2018, <a href="https://www.cse.sc.edu/~jokane/agitr/">https://www.cse.sc.edu/~jokane/agitr/</a> - <a href="http://wiki.ros.org/">http://wiki.ros.org/</a>
<b>Attendance</b>	
<b>Comments</b>	This course requires a (reasonably) powerful computer:- min i5 (7th gen.)- 8GB RAM (Ubuntu)   16GB RAM (Windows)

## Building and Solar Energy

<b>Degree programme</b>	ECI
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	6.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Design of a solar system for a housing complex including technical parameter, contribution to the local electricity system including heating and mobility needs; economic calculation, ecologic impact.
<b>Teaching methods</b>	Project-Based Learning method. Combined with lectures and

	practical teaching on the remote laboratories. Supported by virtual learning environment and simulation.
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- Design preliminary concepts and design of energy efficient building supported by solar energy</li> <li>- Simulation of a solar energy system</li> <li>- Possibilities of building integrated photovoltaics and construction design</li> <li>- Overview of the market, drivers, stakeholders for integration of affordable renewable energy systems</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Energy characterization and energy planning of solar building</li> <li>- Designing a building-integrated photovoltaic installation by software tools</li> <li>- Measurement and analysis of solar systems in the lab</li> <li>- Best practice of solar design (Excursion)</li> <li>- Overview of the market, legislative and drivers for solar energy and buildings</li> </ul>
<b>Prerequisites</b>	Basic knowledge at least in one or two of the following topics: - Building construction - Solar energy system - Energy planning of buildings
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Lecture notes</li> <li>- Grading of practical session</li> <li>- Project reports</li> </ul>
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Cost Optimal and Nearly Zero-Energy Buildings (nZEB) Definitions, Calculation Principles and Case Studies, Editors: Kurnitski, Jarek (Ed.)</li> <li>- Designing with Solar Power: Source book for Building Integrated Photovoltaics. D. Prasad, M. Snow Routledge</li> <li>- Modeling, Design, and Optimization of Net-Zero Energy Buildings Athienitis (Ed.), W.O'Brien (Ed.), ISBN: 978-3-433-03083-7, February 2015</li> <li>- Building integrated photovoltaics: A handbook S. Roberts and N. Guariento, Editors: Springer</li> </ul>
<b>Attendance</b>	Attendance is mandatory in this course, only 20% of absence is accepted.
<b>Comments</b>	Mixed: Incoming students in collaboration with FHTW Master students - Project-based learning on real city development project from city of Vienna (MA20) or the city of Korneuburg - Integration in the curricula of the Master program of renewable energy

## International Marketing

<b>Degree programme</b>	ECI
<b>Semester</b>	2
<b>Course methods</b>	SO
<b>Language</b>	English
<b>ECTS Credits</b>	6.00
<b>Incoming places</b>	Limited

<b>Course description</b>	The decision whether to internationalize: Understanding internationalization motives, barriers and risks; value net analysis of international competitiveness; Deciding which markets to enter: Global market research; market selection process; environmental analysis; Market entry strategy: transaction cost approach; export, intermediate, hierarchical entry modes; international buyer-seller relation; Designing of the global Marketing program: Green marketing strategies; cross boarder pricing challenges, channels decisions, international advertising strategies; Global Brand Management: customer based brand equity, brand association map, brand extension and diversification in a global context brand elements;
<b>Teaching methods</b>	Self-study, lecture, distance learning, case studies, group projects
<b>Learning outcome</b>	After passing this course successfully students are able to ... <ul style="list-style-type: none"> <li>- discuss motives and triggers why firms go international</li> <li>- evaluate the factors influencing a firm's international competitiveness</li> <li>- define international market selection and identify the problems related with it</li> <li>- evaluate the factors to consider when choosing a market entry strategy</li> <li>- design global marketing programs</li> <li>- contribute to strategic marketing decisions</li> <li>- understand and contribute to marketing mix decisions</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Internationalization process</li> <li>- Market segmentation</li> <li>- Creating competitive advantage</li> <li>- Global marketing communication</li> <li>- Market selection process</li> </ul>

	<ul style="list-style-type: none"> <li>- Brand building</li> <li>- Marketing Mix decisions</li> </ul>
<b>Prerequisites</b>	none
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Written examination (70%)</li> <li>- Group Assignment (30%)</li> </ul>
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Global Marketing, Hollensen, 2016</li> <li>- International Marketing, Czinkota , Ronkainen 2012</li> <li>- Strategic Brand Management, Keller 2013</li> </ul>
<b>Attendance</b>	Attendance is compulsory.
<b>Comments</b>	Detailed information regarding the course is provided via Moodle.

## ASSIST HEIDI Designing and implementing Assistive Tools for people with disabilities

<b>Degree programme</b>	ECI
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	6.00
<b>Incoming places</b>	Limited

<b>Course description</b>	<p>This course brings students and people with disabilities (HEIDI – Human being with disability) together, in order to design and prototype an individual assistive technology solution for them. Students will learn the basics about disability, existing assistive tools, rapid prototyping and microcontrollers and will have access to materials, tools and equipment (e.g. 3D printer etc.). The Smart Living Lab of the UAS Technikum Wien (<a href="https://www.youtube.com/watch?v=qv6cvPn4fNU">https://www.youtube.com/watch?v=qv6cvPn4fNU</a>) provide the perfect environment for the participants. This is the best opportunity to get to know people with disabilities, to contribute, develop and implement your own ideas. The course methodology and contents will be similar to the ASSIST HEIDI summer school 2022 (<a href="https://www.youtube.com/watch?v=oN9UciVc-2I">https://www.youtube.com/watch?v=oN9UciVc-2I</a>).</p>
<b>Teaching methods</b>	Co-Design, Problem-based learning
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- understand daily challenges of people with disabilities</li> </ul>

	<ul style="list-style-type: none"> <li>- understand and apply the principles of co-design</li> <li>- understand types and causes of disabilities</li> <li>- know the current technical aids to support people with disabilities and to be able to select suitable technologies for certain applications</li> <li>- design and implement assistive prototypes using rapid prototyping, microcontrollers or computer vision / ML</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- At the beginning of the course the students will be introduced to UAS Technikum Wien English Course Guide 11 of 162 people with disabilities and will interview them in order to understand their daily challenges and find inspiration for project work. After the project selection the students will form groups of 4-6 persons and collaboratively design and implement a project idea supervised by the lecturers. Finally, the project results must be presented and will be evaluated by the HEIDs and lecturers.</li> <li>- In parallel, several topics will be covered including small exercises: <ul style="list-style-type: none"> <li>- Physiological basics, Types and causes of disabilities</li> <li>- Assistive tools</li> <li>- Rapid Prototyping</li> <li>- Computer vision + ML with python</li> <li>- Arduino microcontroller</li> </ul> </li> <li>- The classes will be held weekly approx. 16:10-17:40. In parallel, regular online sessions are provided on-demand for project supervision approx. 16:10-17:40.</li> </ul>
<b>Prerequisites</b>	Programming, English
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- 2 x Assignments á 10% = 20%</li> <li>- 1 x Project work (graded as group work) 80%</li> </ul>
<b>Recommended Reading and Material</b>	- Author: Dr. Wolfgang L. Zagler, Title: Rehabilitationstechnik, Date: March 1, 2008, Location: Vienna, Austria, Book URL: <a href="https://studyathome.technikum-wien.at:8092/">https://studyathome.technikum-wien.at:8092/</a>
<b>Attendance</b>	Attendance is mandatory in classes on campus.
<b>Comments</b>	

## Empowering Intercultural Teams for Success: Theory - Tactics – Solutions

<b>Degree programme</b>	ECI
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English



<b>ECTS Credits</b>	2.00
<b>Incoming places</b>	Limited

<b>Course description</b>	<p>Simply, the purpose of this course is to help you enhance your employability and further the development of your career prospects. In an increasingly inter-cultural and dynamic world what will be the skills that stand out to attract employers? Intercultural awareness, the ability to work in multi-cultural teams, the ability to demonstrate awareness and agility and the ability to work in an English environment would be some of the important ones that might occur to you. And it is exactly these skills that this interactive and compelling course will help you develop. The course will mix intercultural theory (such as Hofstede's dimensions) and that of building resilient and functional teams (Bruce Tuckman) with a highly interactive practical project where course participants work together to solve a flash business challenge. The course will also enable you to meet many international students from a great variety of nationalities! Some testimonials from students who took the course in the Winter Semester: 'In this course you get the perfect combination of theoretical inputs and practical work in the topic of Business in different cultures and countries. At the same time you get to meet students from around the world.' 'The ECI Course gave me an insight into the world of intercultural team work that is very valuable, also for general management. The culturally diverse team itself and the lecturers created a good working environment.' 'As a student in the ECI Course, I've been able to gain valuable insights into intercultural team dynamics and expand my management skills while working with a diverse team and learning from expert instructors.'</p>
<b>Teaching methods</b>	Theoretical input, group workshops, teamwork, group discussions, independent research, participant preparation of written documents.
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- question their culturally formed stereotypes and prejudices;</li> <li>- reflect on different strategies for dealing successfully with cultural differences;</li> <li>- apply strategies to overcome problems related to intercultural differences;</li> <li>- work successfully in an English as a Lingua Franca environment;</li> <li>- cooperate effectively in intercultural teams to overcome and solve cultural problems and issues.</li> </ul>
<b>Course contents</b>	- Attributes of a successful intercultural team participant/leader;

	<ul style="list-style-type: none"> <li>- Hofstede's cultural dimensions;</li> <li>- Techniques for efficient communication in English as a Lingua Franca;</li> <li>- Strategies for working successfully in an intercultural team;</li> <li>- Problem based intercultural workshop</li> </ul>
<b>Prerequisites</b>	B2 English level
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- 25% student presentation</li> <li>- 50% successful completion of workshop</li> <li>- 25% final written task</li> </ul>
<b>Recommended Reading and Material</b>	- Script
<b>Attendance</b>	75% mandatory
<b>Comments</b>	

## Experience Erasmus+: Preparation and Awareness for a Profitable Semester Abroad

<b>Degree programme</b>	ECI
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	<p>Do you want to study abroad and do you want to get the most out of your time studying abroad? Then this course is for you! Here, we will be examining cultural differences and how to work with them as well as ways in which universities and systems of education can differ across countries and how to negotiate these differences. This will be a highly interactive course: I will be presenting key aspects of intercultural theory and you will be presenting study experiences in specific countries and working through case studies together. There will also be many opportunities to improve your communication skills in English as a medium of communication (by learning suitable strategies) and also many opportunities to work with and get to know other international students. The course has been running successfully for one semester and I have lots of ideas to make it even more useful and absorbing in the coming semester!</p>
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<b>Teaching methods</b>	Theoretical input, group workshops, teamwork, group discussions, independent research, participant preparation of written documents.
<b>Learning outcome</b>	After passing this course successfully students are able to ... - question their cultural stereotypes and prejudices in the context of Erasmus+; - •reflect on different strategies for dealing successfully with likely cultural differences during their semester abroad; - understand the approaches they can use to prepare for the bureaucratic and technical challenges of their semester abroad; - negotiate a variety of typical challenging situations that they will likely face in an international environment.
<b>Course contents</b>	- Tactics, personal behaviours and qualities to be strengthened for achieving success during the semester abroad; - Bettering intercultural awareness and recognition of stereotyping; - Hofstede's cultural dimensions; - Techniques for efficient communication in English as a Lingua Franca; - Practice in overcoming challenges and problems in an intercultural environment (role plays)
<b>Prerequisites</b>	B2 level English
<b>Assessment Methods</b>	- 50% student presentations - 25% completion of participation tasks - 25% final written task
<b>Recommended Reading and Material</b>	- Script
<b>Attendance</b>	75% mandatory
<b>Comments</b>	

## CI\_Traffic Safety Culture and Mobility

<b>Degree programme</b>	ECI
<b>Semester</b>	1
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	This integrated course provides insights to theoretical background and practical issues of national, regional and local aspects of traffic safety culture and mobility in the Vienna region as well as human factors in transportation and mobility.
<b>Teaching methods</b>	Mandatory readings, individual investigation, presentations and group discussions in plenum and breakout sessions. Some frontal teaching.
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- explain the concept of traffic safety culture and practically apply it to plan their mobility, safely and efficiently travel to all relevant points of interest</li> <li>- understand local particularities and consider them for a safe movement during their stay in Vienna and beyond</li> <li>- gain basic understanding of important psychological concepts relevant for research of human factors in mobility (technology acceptance, emotions &amp; aggression, perception). Those concepts can be operationalized and measured, thus considered for the students' own research</li> </ul>
<b>Course contents</b>	<p>- Applied: The concept of traffic safety culture and its application to any place in the world, in particular to the Vienna region. Planning trips using all modes from the most individual (bicycle, e-scooter) to the to the most public means of transport (bus, underground, train). Practical aspects from buying tickets to some of the strangest traffic rules in Austria. Acquisition of a driving license as well as use of shared vehicles. Points of interest from administration to sports.</p> <p>Theory and Research: •Elaboration of different concepts of traffic safety culture and their application in different professional contexts. Operationalization and measurement of traffic safety culture as well as intervention strategies on different levels (example of local road safety culture). •Human factors in the context of increasing vehicle automation: cooperation between driver and vehicle, new 'driving' skills (monitoring, vigilance), driver training of the future, ethical dilemmas •Acceptance of new technology: different types of adoptions, influencing factors and how to measure acceptance •Aggression in traffic: why can traffic be so hostile? Genesis, contributing and mitigating factors</p>
<b>Prerequisites</b>	None
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Reports on mandatory readings (30%)</li> <li>- active participation (30%)</li> <li>- Exam</li> </ul>

<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Ward, N. J., Watson, B., &amp; Fleming-Vogl, K. (Eds.). (2019). Traffic Safety Culture: Definition, Foundation, and Application. Emerald Group Publishing.</li> <li>- Shinar, D. (Ed.). (2017). Traffic safety and human behavior. Emerald Group Publishing.</li> <li>- Journal Transportation Research Part F</li> <li>- Journal of Transportation and Health</li> </ul>
<b>Attendance</b>	Attendance is mandatory in this course, only 20% of absence is tolerated. In case you miss more than 20% of the class you lose the first try in the exam.
<b>Comments</b>	

## CI\_Electronic Laboratory

<b>Degree programme</b>	ECI
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	This integrated course provides students the opportunity to calculate and build electronic circuits, as well as measuring their characteristics with modern measuring devices.
<b>Teaching methods</b>	The Lecturer will explain briefly the basic concepts students need to know to perform the experiment at hand. The students will work in groups to perform the experiment. The Lecturer will be available to assist the students in building and measuring their experiment, as well as to clarify any questions and solve any problems that may arise in the process.
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- measure voltages and currents with a DMM and oscilloscope correctly</li> <li>- produce signals with the Function Generator</li> <li>- calculate electronic circuits, build them and measure their outputs and characteristics</li> <li>- measure the output of circuits involving resistors, capacitors, diodes and OpAmps with the oscilloscope</li> </ul>

<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Oscilloscope and Function Generator</li> <li>- Kirchhoff laws</li> <li>- Diode and Zener Diode</li> <li>- DC Power supply design and implementation</li> <li>- OpAmp circuits</li> <li>- RC Circuit: DC and AC analysis</li> <li>- Transistor Amplifiers</li> <li>- Project: Audio Equaliser</li> </ul>
<b>Prerequisites</b>	Students should have basic knowledge of electronics and electronic circuits.
<b>Assessment Methods</b>	- The students will be assessed according to how far they completed the experiment at hand.
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Maxfield et al., "Electrical Engineering know it all", Newnes &amp; Elsevier, 2008.</li> <li>- Scripts and materials provided by the lecturer.</li> </ul>
<b>Attendance</b>	Attendance is mandatory in this course, only 20% of absence is tolerated. In case you miss more than 20% of the class you lose the first try in the exam.
<b>Comments</b>	

## CI\_Scientific Writing

<b>Degree programme</b>	ECI
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	This hands-on-course dives deep into the praxis of scientific writing. Theory and basics of scientific writing are subjects of online learning, while the meetings are used to practice, analyse und discuss your own scientific writing.
<b>Teaching methods</b>	Exercises, peer-learning, talks, discussions, online-tasks
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- Define, describe, identify and evaluate academic resources</li> <li>- Describe and apply the common structure of a scientific paper</li> </ul>

	<ul style="list-style-type: none"> <li>- Discuss the different kinds of research questions and apply them to their field or research</li> <li>- Describe and discuss the common structure of a Bachelor's Thesis or Master's thesis</li> <li>- Write text according to common standards of academic writing</li> </ul>
<b>Course contents</b>	- How is academic writing done? Where to find resources and references? What kind of scientific writing is adequate for which purpose? How are scientific papers structured? How to cite correctly? Which style of language is adequate?
<b>Prerequisites</b>	Basic knowledge of scientific keyterms and principles.
<b>Assessment Methods</b>	- Course immanent assessment method and end exam
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Leedy, Ormrod: Practical Research. Planning and Design. Pearson</li> <li>- Skern: Writing Scientific English. Facultas wuv UTB</li> </ul>
<b>Attendance</b>	Attendance is partly mandatory in this course. You can attend every class, and should at least participate in two sessions (50%) after the Kick-off.
<b>Comments</b>	

## CI\_Renewable Energy Laboratory

<b>Degree programme</b>	ECI
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Experimental setup of different means of measuring methods to evaluate the performance of renewable energy technologies and systems.
<b>Teaching methods</b>	Laboratory exercises in small groups of typically 8-12 students
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- measure and analyze the energetic performance of components of energy conversion systems and measure and interpret the power quality of energy networks</li> <li>- measure and analyze the energetic performance of heat pumps,</li> <li>- measure and analyze the energetic performance of thermal solar</li> </ul>

	plants and photovoltaic plants, - measure certain parameters of ventilation and hydraulic systems and interpret it.
<b>Course contents</b>	- Measurements and analysis of the energetic performance of energy conversion systems, - analysis of the power quality of electrical networks, - measurement and analysis of the efficiency of heat pump systems, - measurements and performance tests of solar thermal and photovoltaic plants, - performance tests of ventilation and hydraulic systems
<b>Prerequisites</b>	Basics in: - Electrical machines - Mechanical engineering - Thermodynamics - Instrumentation
<b>Assessment Methods</b>	- Laboratory notes - Laboratory reports - Grading of practical session - Laboratory reports
<b>Recommended Reading and Material</b>	- Scripts of the lecturers
<b>Attendance</b>	Attendance is mandatory in this course, only 20% of absence is tolerated. In case you miss more than 20% of the class you lose the first try in the exam.
<b>Comments</b>	

## CI\_Audio Engineering

<b>Degree programme</b>	ECI
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	This integrated course provides students the opportunity to familiarise themselves with the basics of acoustics and audio engineering, including perception of sound, microphones, amplifiers, loudspeakers, audio processing, etc.
<b>Teaching methods</b>	The Lecturer will explain some basic concepts. The students will compete tasks in the computer using Matlab.



<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- Understand the signal chain in a typical audio application, and be able to recognise and avoid distortions in all stages</li> <li>- understand how humans perceive sound,</li> <li>- record sounds using the appropriate equipment,</li> <li>- measure different attributes of sound and understand how they correlate to human perception,</li> <li>- analyse and interpret recorded sounds</li> <li>- synthesise sounds with specific attributes</li> <li>- perform audio processing on recordings</li> <li>- understand how audio compression works</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Sound and sound attributes</li> <li>- Human perception of sound</li> <li>- Signal chain in audio engineering</li> <li>- Microphones and amplifiers</li> <li>- Analog vs digital signals</li> <li>- Fourier Analysis, Spectrum, Spectrogram</li> <li>- Synthesis of sounds</li> <li>- Filters</li> <li>- Audio compression</li> <li>- Loudspeakers</li> </ul>
<b>Prerequisites</b>	Basic programming skills. Matlab knowledge advantageous.
<b>Assessment Methods</b>	- The students will be assessed according to how far they completed the task at hand
<b>Recommended Reading and Material</b>	- Script provided by the lecturer
<b>Attendance</b>	Attendance is mandatory in this course, only 20% of absence is tolerated. In case you miss more than 20% of the class you lose the first try in the exam.
<b>Comments</b>	

## CI\_Building Climate Engineering

<b>Degree programme</b>	ECI
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	3.00

<b>Incoming places</b>	Limited
<b>Course description</b>	Theoretical and practical basics of Building Energy Design: energy efficient constructions, building physics, heating, ventilation and air conditioning of energy efficient buildings in Austria and internationally.
<b>Teaching methods</b>	Lectures combined with practical teaching on the construction site of an energy efficient building.
<b>Learning outcome</b>	After passing this course successfully students are able to ... <ul style="list-style-type: none"> <li>- analyze different building construction components, facades and window concerning their energy efficiency, comfort and building physics,</li> <li>- design preliminary concepts of energy efficient projects,</li> <li>- overview possibilities of ventilation, heating and cooling,</li> <li>- compare different construction techniques concerning energy efficiency, building quality and comfort, especially related to their home country.</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Basics of building physics, heat, humidity and sound protection</li> <li>- Building construction components from the view point of building physics and energy efficiency, comparison on international basis</li> <li>- Heating, cooling and ventilation possibilities,</li> <li>- Energy benchmark levels, calculating of the energy demand of buildings</li> </ul>
<b>Prerequisites</b>	Basic knowledge at least in one or two of the following topics: - Building construction- Building physics - Heating, ventilation and air conditioning - Energy planning of buildings
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Combined written and oral exam, written exam in 2-3 examples 40% Cooperation, attendance 20%</li> <li>- Project including energy layout and a short planning example of heating, ventilation and/or cooling 40%</li> </ul>
<b>Recommended Reading and Material</b>	- Gerhard Hausladen, Saldanha, Liedl, 2013: Climate Skin Building Skin Concepts that can do more with less energy, ISBN978-3-0346-0727-8, Birkhäuser Verlag Basel
<b>Attendance</b>	Attendance is mandatory in this course, only 20% of absence is tolerated. In case you miss more than 20% of the class you lose the first try in the exam.
<b>Comments</b>	

<b>Degree programme</b>	ECI
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Basics in German grammar and conversation. The course should prepare you to get along in everyday situations. To get and to give simple personal information, information about your life and your work. Basic grammar: the article tenses, pronouns, word order, question and negation, modal verbstopics: me and the others, people and things, student's life, living, shopping
<b>Teaching methods</b>	group work, role plays, text production, excursion
<b>Learning outcome</b>	After passing this course successfully students are able to ... - master everyday situations in German
<b>Course contents</b>	- Basic Grammar: Verb Konjugation, the article, Nouns in Singular and Plural, Modal Verbs - Topics: Living together, Looking for an apartment, Furniture, clothes, Sights, Arts, Basic information about Austrian culture
<b>Prerequisites</b>	None
<b>Assessment Methods</b>	- mid-term test; Final-Test (written and oral), Attendance, performance in class
<b>Recommended Reading and Material</b>	- 1.) Panorama; Deutsch als Zweitsprache Kursbuch A1.1 ISBN 978-3-06-120472-3; 2.) voluntarily: Übungsbuch A1.1. ISBN 978-3-06-120602-4
<b>Attendance</b>	minimum attendance of 75 % required
<b>Comments</b>	Try to have the book for the first lesson. It is available at "THALIA" bookshops

## CI\_German Language & Austrian Culture A2

<b>Degree programme</b>	ECI
<b>Semester</b>	2
<b>Course methods</b>	ILV

<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Based on the A1 course we train frequently used expressions related to areas of most immediate relevance (e.g. very basic personal and family information, shopping, local geography, employment). The course will teach frequently used expressions related to very basic personal and family information, shopping, local geography, employment. indefinite pronouns
<b>Teaching methods</b>	group work, role play, text production, homework
<b>Learning outcome</b>	After passing this course successfully students are able to ... - understand sentences and frequently used expressions related to areas of most immediate relevance (e.g. very basic personal and family information, shopping, local geography, employment). Can communicate in simple and routine tasks requiring a simple and direct exchange of information on familiar and routine matters. Can describe in simple terms aspects of his/her background, immediate environment and matters in areas of immediate need
<b>Course contents</b>	- Grammar: regular and irregular verbs in Perfect, prepositions with Akkusativ+Dativ, separable verbs - Topics: Living together, Looking for an apartment, Furniture, clothes, Sights, Arts, Basic information about Austrian culture
<b>Prerequisites</b>	A1
<b>Assessment Methods</b>	
<b>Recommended Reading and Material</b>	- Panorama Deutsch Als Fremdsprache ; Kursbuch A2.1 Cornelsen Verlag ISBN 978-3-06-120488-4( also available as E-Book)/voluntarily: Übungsbuch A2.1 ISBN 978-3-06-120604-8
<b>Attendance</b>	Intermediate Test Final Test (written and oral) Attendance and performance in Class
<b>Comments</b>	Try to have the book for the first lesson. It is available at "THALIA" bookshops

## CI\_German Language & Austrian Culture B1

<b>Degree programme</b>	ECI
<b>Semester</b>	2

<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	This integrated course provides the linguistic skills to deal with most situations likely to arise whilst you are staying in Austria. You will be prepared to enter into conversation on topics that are familiar, of personal interest or pertinent to everyday life (e.g. family, hobbies, work, travel and current events).
<b>Teaching methods</b>	Group work, role plays, text production, excursion, audio- and video files, authentic texts
<b>Learning outcome</b>	After passing this course successfully students are able to ... - understand the main points of clear standard speech on familiar matters regularly encountered in work, school, leisure, etc - understand the main point of many radio or TV programmes on current affairs or topics of personal or professional interest when the delivery is relatively slow and clear. - understand texts that consist mainly of high frequency everyday or job-related language. - understand the description of events, feelings and wishes in personal letters.
<b>Course contents</b>	- Topics: Family life, contacts, men and women today, work environment, travelling and traffic, nature and environment - Grammar: Subordinate clauses, adjective+article, infinitive construction, Tenses, reflexive pronouns, subjunctive I +II, passive voice
<b>Prerequisites</b>	German A2 level
<b>Assessment Methods</b>	- Tests (mid-term and final test,) performance in class, homework
<b>Recommended Reading and Material</b>	
<b>Attendance</b>	80%
<b>Comments</b>	

## CI\_German Language & Austrian Culture B2

<b>Degree programme</b>	ECI
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<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Repetition, perfection and exercises of relevant grammatical structures • Vocabulary and useful phrases for B2 • Economy / career / work • New technology • Modern life / society
<b>Teaching methods</b>	Normal class with presence (15 UE): Discussions, work in large and small groups and presentation of your results you have prepared in form of a short text. AND E-learning with Moodle (15 UE): Single work with deadline for interim reports, exercises on reading, grammatical issues and vocabulary, writing 3 short texts (400 words each) and revision of the 3 texts.
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- understand grammatically complex texts which are rich in vocabulary on the level B2</li> <li>- write a summary and comment the main topics of a text.</li> </ul> <p>Furthermore you have developed and enlarged your knowledge of German for the purpose of your studies</p> <ul style="list-style-type: none"> <li>- You have improved and clarified your writing skills as well as you can refer to phrases of argumentation.</li> <li>- describe and comment graphics and you can take a critical point of view in the context of a text.</li> <li>- write a request, a letter of complaint with the appropriate register</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Reading of press articles and exercises in global and close reading as well as training of vocabulary and grammar</li> <li>- Writing summaries and expressing your point of view with the right expressions</li> <li>- Expressing advantages or disadvantages</li> <li>- Writing a letter of complaint or a request with the right expressions</li> <li>- Reporting about texts, describing and commenting graphics in the context of an article</li> <li>- Making an interview in the context of your studies and writing about your learning outcome</li> </ul>
<b>Prerequisites</b>	Only for students with a good knowledge of German who are interested in improving their writing skills

<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- 1) 3 texts Option A Writing a summary and a comment on 3 long newspaper articles (1 with graphics) in the amount of about 400 words. OR Option B: Writing a summary and comment on 2 long newspaper articles (1 with graphics) in the amount of about 400 words and make a study-specific interview with a person of your interest, write a transcription/summary and reflect about your learning outcome. (50 points)</li> <li>- 2) Exercises on Moodle (25 points)</li> <li>- 3) Active participation (25 points)</li> </ul>
<b>Recommended Reading and Material</b>	- Texts and exercises on Moodle and handouts of the regular class.
<b>Attendance</b>	Compulsary
<b>Comments</b>	

# BACHELOR DEGREE PROGRAMS

## Electronics and Business (BEW)

### Electronic Project 2

<b>Degree programme</b>	BEW
<b>Semester</b>	4
<b>Course methods</b>	FUV
<b>Language</b>	English
<b>ECTS Credits</b>	6.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Application of electronic design to develop an electronic device in a project environment. Theme control systems
<b>Teaching methods</b>	
<b>Learning outcome</b>	After passing this course successfully students are able to ... <ul style="list-style-type: none"> <li>- design and simulate electronic circuits</li> <li>- assemble prototypes, to operate and measure them</li> <li>- design and simulate analog and digital control Systems</li> <li>- design algorithms for control systems and apply them on a microprocessor</li> <li>- write technical documentations</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Analog and digital control Systems</li> <li>- C-programming</li> <li>- Microcontroller programming</li> <li>- Simulation in MatLab</li> </ul>
<b>Prerequisites</b>	Control systems
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Course immanent assessment method</li> <li>- Technical documentation</li> <li>- Individual examination of circuit and measurement knowledge</li> <li>- Working prototype</li> </ul>
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Hager, Wilhelm (200): Regelungstechnik, öbv</li> <li>- Schmidt, Günther (1994): Grundlagen der Regelungstechnik, Springer</li> <li>- Tietze, Ulrich / Schenk, Christoph / Gamm, Eberhard (1999): Halbleiter – Schaltungstechnik, Springer</li> </ul>



	- Scripts
<b>Attendance</b>	compulsory attendance during on-campus phases
<b>Comments</b>	

## Business Communication for Engineers

<b>Degree programme</b>	BEW
<b>Semester</b>	4
<b>Course methods</b>	SE
<b>Language</b>	English
<b>ECTS Credits</b>	1.50
<b>Incoming places</b>	Limited

<b>Course description</b>	Starting from the Common European Framework of Reference for Languages B2, students engage with global economic and technical developments and their impact on society, and thereby acquire relevant terms and concepts together with the appropriate language skills
<b>Teaching methods</b>	
<b>Learning outcome</b>	After passing this course successfully students are able to ... - recognize connections between economic theories and forms of government - analyze the impact of globalization on society and the Environment - compare and contrast corporate innovation models
<b>Course contents</b>	- Economic concepts and theories - Winners and losers of globalization - Development of technologies - Innovation
<b>Prerequisites</b>	Completion of previous course
<b>Assessment Methods</b>	- Course immanent assessment method, i.e. active participation in class activities and timely completion of assignments
<b>Recommended Reading and Material</b>	- Maderdonner, O. / et al (2014): Economy, Technology and Society, Skriptum - Additional current handouts and audio-visual support
<b>Attendance</b>	compulsory attendance during on-campus phases
<b>Comments</b>	

## Communication Technologies

<b>Degree programme</b>	BEW
<b>Semester</b>	4
<b>Course methods</b>	FUV
<b>Language</b>	English
<b>ECTS Credits</b>	6.00
<b>Incoming places</b>	Limited

<b>Course description</b>	This lecture offers an introduction to digital mobile communication. On the one hand, fundamentals and implementation of mobile communication systems, in particular with the focus on:- 2nd Generation of mobile networks (GSM und GPRS)- 3rd Generation of mobile networks (UMTS)- 4th Generation of the mobile networks (LTE)are covered and on the other hand, the course presents fundamental techniques for data compression, channel coding and channel modeling, in particular with the focus on:- entropy coding- linear block codes- discrete channels
<b>Teaching methods</b>	
<b>Learning outcome</b>	After passing this course successfully students are able to ... <ul style="list-style-type: none"> <li>- outline and compare different mobile network architectures</li> <li>- explain mobile radio interfaces and to list their characteristics</li> <li>- describe different mobile network use cases</li> <li>- calculate characteristics of information sources (e.g. information content, entropy)</li> <li>- design a binary coding with minimum average code word length for information sources</li> <li>- apply linear block codes to detect and correct errors</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Radio interface, network architecture and functionalities in 2nd generation of mobile networks (GSM and GPRS)</li> <li>- Radio interface, network architecture and functionalities in 3rd generation of mobile networks (UMTS)</li> <li>- Radio interface, network architecture and functionalities in 4th generation of the mobile networks (LTE)</li> <li>- Principles of information theory (information content, entropy, Markov sources)</li> <li>- Entropy coding (Huffman and Arithmetic Coding)</li> <li>- Pre-Coding (run length encoding, quadtree coding)</li> </ul>

	<ul style="list-style-type: none"> <li>- Encoding and decoding with linear block codes (generator matrix, parity check matrix, syndrome)</li> <li>- Receiver strategies and channel capacity</li> </ul>
<b>Prerequisites</b>	To successfully pass the course, students must have basic mathematical knowledge in:- statistics- linear algebra
<b>Assessment Methods</b>	- Course immanent assessment method (regular homeworks) and end exam
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- J. G. Proakis, M. Salehi, Digital Communications, Fifth Edition, McGraw-Hill, New York, 2008</li> <li>- J. Schiller, Mobile Communications, Second Edition, Pearson Education Limited, 2003</li> <li>- B. Walke, Mobilfunknetze und ihre Protokolle, Band 1 und 2, B. G. Teubner, Stuttgart, 1998.</li> <li>- B. Walke, M. P. Althoff, P. Seidenberg, UMTS –Ein Kurs, J.SchlembachFachverlag, 2001</li> </ul>
<b>Attendance</b>	compulsory attendance during on-campus phases
<b>Comments</b>	

## Computer Science 4

<b>Degree programme</b>	BEW
<b>Semester</b>	4
<b>Course methods</b>	FUV
<b>Language</b>	English
<b>ECTS Credits</b>	6.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Computer science
<b>Teaching methods</b>	Distance Learning
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- - simulate execution of object-oriented Java programs with pen and paper and predict behaviour and output for given input.</li> <li>- - implement entity classes with several class invariants in Java.</li> <li>- - analyse requirements based on class diagrams and javadocs and implement those requirements</li> <li>- - re-implement behaviour of concrete super-classes in concrete (sub-) classes.</li> </ul>

	<ul style="list-style-type: none"> <li>- use classes in object oriented Java applications</li> <li>- implement a sortable and searchable linked list of several types of persons.</li> <li>- export and import data to/from text-files with streams and correct exception handling.</li> <li>- implement a console-based, text-menu-driven application with extendable display options using a searchable, sortable custom container that supports file import/export.</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Object Oriented Programming (Classes, Objects, Reference, Inheritance, Polymorphism, Interfaces, inner classes)</li> <li>- Exceptions and Exception handling</li> <li>- Introduction to JAVA Collection Framework (Core Collection Interfaces, Iterators, ArrayList, LinkedList)</li> </ul>
<b>Prerequisites</b>	Computer Science 1-3
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- extra credit for continuous submission - final project - final test (PC-based)</li> </ul>
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- David J. Eck: Introduction to Programming using Java. (several versions, free!) [<a href="http://math.hws.edu/javanotes/">http://math.hws.edu/javanotes/</a>]</li> <li>- Bert Bates, Kathy Sierra: Head First Java. 2003, O'Reilly Media (ISBN: 978-0-596-00465-1) other</li> <li>- Bruce eckel: Thinking in Java. several editions, some freely available. [<a href="http://www.mindview.net/Books/TIJ/">http://www.mindview.net/Books/TIJ/</a>]</li> <li>- Joshua Bloch: Effective Java: A Programming Language Guide. 2008 Addison-Wesley Longmann. (ISBN: 978-0321356680)</li> <li>- Joshua Bloch, Neal Gafter: Java Puzzlers: Traps, Pitfalls, and Corner Cases. 2005, Addison-Wesley Longmann. (ISBN: 978-0321336781)</li> <li>- tutorials and additional information on java webpage [<a href="http://www.oracle.com/technetwork/java/index.html">http://www.oracle.com/technetwork/java/index.html</a>]</li> </ul>
<b>Attendance</b>	kickoff and final test mandatory
<b>Comments</b>	-

## Moderation & Problem Solving Techniques

<b>Degree programme</b>	BEW
<b>Semester</b>	4
<b>Course methods</b>	FUV
<b>Language</b>	English

<b>ECTS Credits</b>	1.50
<b>Incoming places</b>	Limited

<b>Course description</b>	The course prepares the students for the role of a facilitator using relevant methods of problem solving and supporting creativity.
<b>Teaching methods</b>	
<b>Learning outcome</b>	After passing this course successfully students are able to ... - plan a moderation cycle adapted to task and the needs of the target group. - explain selected creativity techniques (e.g. emotive word analysis, morphological box) and to apply them by means of examples. - explain selected analysis and decision-making techniques (e.g. Fishbone Diagram, decision matrix) and to apply them by the means of examples.
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Objectives and roles (eg. moderator, keep a log) of moderation</li> <li>- Expiration of a moderation</li> <li>- Brainstorming and creativity techniques</li> <li>- Analysis and Decision-Making-Techniques "</li> </ul>
<b>Prerequisites</b>	none
<b>Assessment Methods</b>	- Course immanent assessment method
<b>Recommended Reading and Material</b>	- Pocket Mentor Series (2008): Making decisions, Boston, Harvard Business School Press
<b>Attendance</b>	compulsory attendance during on-campus phases
<b>Comments</b>	none

## Business Administration 2

<b>Degree programme</b>	BEW
<b>Semester</b>	4
<b>Course methods</b>	FUV
<b>Language</b>	English
<b>ECTS Credits</b>	6.00
<b>Incoming places</b>	Limited

<b>Course description</b>	The course gives an introduction in the area of business administration, with special focus on cost accounting, budgeting and
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	capital investment.
<b>Teaching methods</b>	Distance Learning, Assignments, Videos, Group Work
<b>Learning outcome</b>	After passing this course successfully students are able to ... - explain tasks and functions of management accounting, - calculate costs and determine prices, - prepare a simple master budget, - make capital investment decisions based on qualitative and quantitative information.
<b>Course contents</b>	- management accounting - capital budgeting - budgeting - direct and indirect costs
<b>Prerequisites</b>	Business Administration 1
<b>Assessment Methods</b>	- course immanent assessment + final written exam
<b>Recommended Reading and Material</b>	- John R. Dyson, Accounting for non-accounting students, eight edition, Pearson
<b>Attendance</b>	Attendance is compulsory during on-Campus phases
<b>Comments</b>	

### Physics 3

<b>Degree programme</b>	BEW
<b>Semester</b>	4
<b>Course methods</b>	FUV
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Course mainly focuses physical problems solvable by ODEs: for example: growth phenomena and oscillations. Prospects to wave phenomena and transport phenomena as thermal conductivity effects.
<b>Teaching methods</b>	Blended learning with MoodlePrivate study of well defined tasksIndividual written elaboration and collegiate review
<b>Learning outcome</b>	After passing this course successfully students are able to ... - Description of physical problemsMathematical solution and

	interpretation of resultsHow to use specific literature
<b>Course contents</b>	- ElectricityMagnetismGrowth EffectsOscillationProspects to wave phenomena and transport phenomena as thermal conductivity effectsUncertainty in Measurement Results
<b>Prerequisites</b>	Elementary physics and mathematics
<b>Assessment Methods</b>	- Individual written elaborationCollegiate reviewExamination
<b>Recommended Reading and Material</b>	- Gerthsen: PhysikTipler: PhysikModul ScriptsWeb
<b>Attendance</b>	
<b>Comments</b>	

## Advanced Communication

<b>Degree programme</b>	BEW
<b>Semester</b>	6
<b>Course methods</b>	SE
<b>Language</b>	English
<b>ECTS Credits</b>	1.50
<b>Incoming places</b>	Limited

<b>Course description</b>	The students acquire writing and speaking skills necessary to complete their bachelor studies, such as writing abstracts and techniques for successful presentations
<b>Teaching methods</b>	
<b>Learning outcome</b>	After passing this course successfully students are able to ... - write abstracts in compliance with given formal and language-related Guidelines - present one of their term papers in english to the exam committee and to defend their paper
<b>Course contents</b>	- Structure of an abstract vs. German summary - Writing process - Building an English presentation from a German paper - Presentation techniques and relevant language
<b>Prerequisites</b>	Common European Framework of Reference for Languages Level B2Completion of previous semester course

<b>Assessment Methods</b>	- Course immanent assessment method, i.e. active participation in class activities and timely completion of assignments
<b>Recommended Reading and Material</b>	- Maderdonner, O. / et al (2014): Abstract Writing, Skriptum - Maderdonner, O. / et al (2014): Presentation Essentials, Skriptum - Additional current handouts and audio-visual support
<b>Attendance</b>	compulsory attendance during on-campus phases
<b>Comments</b>	

## Business Law

<b>Degree programme</b>	BEW
<b>Semester</b>	6
<b>Course methods</b>	FUV
<b>Language</b>	English
<b>ECTS Credits</b>	6.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Imparting knowledge of selected legal topics regarding the international economic law
<b>Teaching methods</b>	*) Presentations and examples for self assessment *) Case studies as examples and for self study *) Scripts for self study
<b>Learning outcome</b>	After passing this course successfully students are able to ... - specify the legal rules - interpret legal cases - find solutions for legal problems by using these legal rules - utilise selected legal data-banks - evaluate legal decisions concerning defined questions and answer these questions - develop arguments to justify legal decisions
<b>Course contents</b>	- International Economic Law, Introduction, Actors and Rules/Principles - World Trade Organization (WTO) and law of the WTO - United Nations Convention on Contracts for the International sale of goods - Law of the European Union & Case Study - Competition Law - International property rights



<b>Prerequisites</b>	None
<b>Assessment Methods</b>	- Assignments (50%) and Exam (50%), but at least 1% from each part
<b>Recommended Reading and Material</b>	- Scripts and materials (audio-visual presentations, etc.) available in the downloadarea of moodle
<b>Attendance</b>	compulsory attendance during on-campus-phases
<b>Comments</b>	

## Change Management

<b>Degree programme</b>	BEW
<b>Semester</b>	6
<b>Course methods</b>	FUV
<b>Language</b>	English
<b>ECTS Credits</b>	1.50
<b>Incoming places</b>	Limited

<b>Course description</b>	The course Change Management prepares the students for contact with change processes from a systemic view.
<b>Teaching methods</b>	
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- identify phases (for example by B. Conner ) and dynamics (symptoms, causes) of resistance using simple examples and explain.</li> <li>- name basic models of change management ( for example 3-phase-model of Lewin, strategy models of Glasl) and to analyze concrete situations by reference to them.</li> <li>- explain methods of integration of employees (for example kick-off workshop , interview ) and to explain consequences of participation / non-participation.</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Guidelines and models for change processes</li> <li>- Context clarification</li> <li>- Handling of resistance</li> <li>- Systemic Thinking</li> <li>- Methods of employee participation</li> </ul>
<b>Prerequisites</b>	none

<b>Assessment Methods</b>	- Course immanent assessment method (participated successfully)
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Conner, Daryl R. (2006): Managing at the speed of change, Verlag Random House, NY</li> <li>- Key Literature of the course: Managing at the Speed of Change: How Resilient Managers Succeed and Prosper Where Others Fail, New York, 2006.</li> <li>- Spencer Johnson, Who moved my Cheese. An Amazing Way to Deal with Change in your Work and in your Life, New York 1998</li> <li>- Jeannene LaMarsh, Changing the Way We Change. Gaining Control of Major Operational Change, 1995</li> <li>- Harvey Robbins, Michael Finley, Why Change doesn't Work. Why Initiatives go Wrong and how to Try Again - and Succeed, 199</li> <li>- Managing Change and Transition. Practical Strategies to Help You Lead During Turbulent Times (Harvard Business Essential Series), 2003</li> </ul>
<b>Attendance</b>	compulsory attendance during on-campus phases
<b>Comments</b>	none

## Technology Management

<b>Degree programme</b>	BEW
<b>Semester</b>	6
<b>Course methods</b>	FUV
<b>Language</b>	English
<b>ECTS Credits</b>	6.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Technology Management
<b>Teaching methods</b>	Lecture, Self Studies, Elaborations on set topics, Preparation of a seminar paper on an individually agreed case.
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- explain typical challenges in Innovation- and Technology Management.</li> <li>- apply simple tools for organizing Innovation and Technology Management projects.</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Differentiation: Technology Management - Innovation Management</li> <li>- Importance of Technology and Innovation Management for</li> </ul>

	enterprises and organizations. - Spotting opportunities for Technology and Innovation Management - Designing plans for Technology and Innovation Management activities.
<b>Prerequisites</b>	According to the position of the course in the Program's Curriculum
<b>Assessment Methods</b>	- Assignments - Presentation - Final written exam
<b>Recommended Reading and Material</b>	- The Tao of Innovation: Nine Questions every Innovator must answer. Tan, Teng-Kee et al., 2015, Imperial College Press, ISBN: 978-1-78326-620-3
<b>Attendance</b>	Compulsory
<b>Comments</b>	

## Electronic Engineering (BEL)

### Business English

<b>Degree programme</b>	BEL
<b>Semester</b>	2
<b>Course methods</b>	UE
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	In this Business English course, students will learn how to write clear, compelling, professional text, as well as, expanding their language toolkit to enable them to record and apply business vocabulary and terminology in the context of future trends in Business and Engineering. These trends would include, amongst others, diversity and inclusion, the globalization of the economy and, also, the internationalization of finance. Moreover, students will advance their verbal and written English language skills by applying critical thinking tools in the creation of impact analyses specifically for technical business audiences of the global community.
<b>Teaching methods</b>	small and medium tasks and activities; open class inputs and discussion; individual task completion settings; peer review and

	discussion
<b>Learning outcome</b>	After passing this course successfully students are able to ... <ul style="list-style-type: none"> <li>- record and employ vocabulary for business in technology</li> <li>- create a business technology impact analysis</li> <li>- articulate both orally and in written form the different ways in which technology impacts business</li> <li>- use specific vocabulary and terminology in, for example, leading a meeting</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Business in Technology (for example finance and investment, the global economy, digital marketing and sales, international teams, and diversity and inclusion)</li> <li>- Impact Analyses for Business and Technology</li> <li>- Business English Talk</li> </ul>
<b>Prerequisites</b>	B2 level English
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- 30% Business Impact Analysis Group Task</li> <li>- 30% Business Impact Analysis Language Task</li> <li>- 40% in-class writing</li> </ul>
<b>Recommended Reading and Material</b>	- Murphy, R. (2019). English Grammar in Use, 5th Edition. Klett Verlag.
<b>Attendance</b>	Obligatory
<b>Comments</b>	

## Chip Design 1

<b>Degree programme</b>	BEL
<b>Semester</b>	4
<b>Course methods</b>	LAB
<b>Language</b>	English
<b>ECTS Credits</b>	5.00
<b>Incoming places</b>	Limited

<b>Course description</b>	This class elaborates on how to design, implement and verify the functionality of digital integrated circuits and systems by using the hardware description language VHDL and FPGAs as target technology.
<b>Teaching methods</b>	

<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- model simple digital circuits and systems consisting of combinatorial and sequential logic with the hardware description language VHDL by applying coding guidelines</li> <li>- verify the proper functionality of these systems by using an industrial logic simulator</li> <li>- synthesize &amp; implement these systems on FPGA devices by using industrial tools</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Introduction to the hardware description language VHDL</li> <li>- Modeling of combinatorial and sequential logic by using VHDL</li> <li>- VHDL coding guidelines</li> <li>- Verification of digital circuits and systems by using an industrial logic simulator</li> <li>- Synthesis and implementation of digital circuits and systems on FPGA devices as target technology by using industrial tools</li> <li>- Project</li> </ul>
<b>Prerequisites</b>	Digital Systems & Computer Architecture
<b>Assessment Methods</b>	
<b>Recommended Reading and Material</b>	
<b>Attendance</b>	mandatory
<b>Comments</b>	none

## Embedded Systems

<b>Degree programme</b>	BEL
<b>Semester</b>	4
<b>Course methods</b>	LAB
<b>Language</b>	English
<b>ECTS Credits</b>	5.00
<b>Incoming places</b>	Limited

<b>Course description</b>	This class deals with the development and implementation of elaborate software projects, based on Embedded Systems and corresponding communication modules.
<b>Teaching methods</b>	impulse lectures, programming labs using hands-on trainings
<b>Learning outcome</b>	After passing this course successfully students are able to ...

	<ul style="list-style-type: none"> <li>- Implement sophisticated communication modules of Embedded Systems (Bluetooth, Wifi, ZigBee, Ethernet, USB, ...)</li> <li>- Utilize existing communication module stacks/software libraries</li> <li>- Record and analyze communication protocols</li> <li>- Implement assignments either based on stand-alone firmware or based on pre-configured Embedded OSs (e.g. Embedded Linux)</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Description of basic concepts for embedded operating systems (e.g. Embedded Linux)</li> <li>- Implementation and description of various sophisticated embedded communication interfaces (e.g. USB, Bluetooth, Wifi, Ethernet, ZigBee, ...)</li> <li>- Implementation of one or more assignments based on embedded hardware platforms (utilizing existing embedded libraries)</li> <li>- Recording and analyzation of data transfers of the embedded communication interfaces, in order to understand the dataflow and the debugger</li> <li>- Implementation of a project based on the course contents</li> <li>- Embedded Systems Operating Systems</li> </ul>
<b>Prerequisites</b>	Programming, Microcontroller
<b>Assessment Methods</b>	- Test, Assessment of task and project submissions
<b>Recommended Reading and Material</b>	
<b>Attendance</b>	mandatory
<b>Comments</b>	none

## Mechanical Engineering (BMB)

### Business English

<b>Degree programme</b>	BMB
<b>Semester</b>	2
<b>Course methods</b>	UE
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	In this course, you will learn some of the key aspects of business
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	communication in English, as well as the key processes and activities of starting a business. This includes figuring out what kind of organization your business should be, how best to market your product, and what considerations you should make about sustainability issues - an increasingly important topic. You will also discover important communication tools in business environments such as meetings, learn how to write clear and compelling reports, and how to use innovative presentation methods to engage your audience.
<b>Teaching methods</b>	Small and medium scale assignments and activities; open-ended assignments and group discussion; individual assignments; peer review and discussion.
<b>Learning outcome</b>	After passing this course successfully students are able to ... - Use business vocabulary in relation to various aspects of business communication - Use functional language in various business situations, such as meetings - Write a business report - Describe financial data - Understand and apply key marketing concepts and related language Business reports
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Business reports</li> <li>- Describe and present visual data</li> <li>- Communicating in a variety of business situations</li> <li>- Presentation in business English</li> </ul>
<b>Prerequisites</b>	English at level B2 of the Common European Framework of Reference for Languages
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Presentation: 50%</li> <li>- Self-study tasks: 20%</li> <li>- Written report task: 30%</li> </ul>
<b>Recommended Reading and Material</b>	- All required literature will be provided on the course page on Moodle
<b>Attendance</b>	Mandatory
<b>Comments</b>	none

## Biomedical Engineering (BBE)

### Business English

<b>Degree programme</b>	BBE
<b>Semester</b>	2
<b>Course methods</b>	UE
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	In this course, you will learn some of the key aspects of business communication in English, as well as the key processes and activities of starting a business. This includes understanding what kind of organization your business should be, how best to market your product, and what considerations you should make about sustainability issues - an increasingly important topic. You will also discover important communication tools in business environments such as meetings, learn how to write clear and compelling reports, and how to use innovative presentation methods to engage your audience.
<b>Teaching methods</b>	Small and medium tasks and activities; open class inputs and discussion; individual task completion settings; peer review and discussion
<b>Learning outcome</b>	After passing this course successfully students are able to ... <ul style="list-style-type: none"> <li>- Use business vocabulary in relation to various aspects of business communication</li> <li>- Use functional language in various business situations, such as meetings</li> <li>- Write a business report</li> <li>- Describe financial data</li> <li>- Understand and apply key marketing concepts and related language Business reports</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Business reports</li> <li>- Describe and present visual data</li> <li>- Communicating in a variety of business situations</li> <li>- Presentation in business English</li> </ul>
<b>Prerequisites</b>	B2 level English
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Presentation: 50%</li> <li>- Self-study tasks: 20%</li> <li>- Written report task: 30%</li> </ul>



<b>Recommended Reading and Material</b>	- All required literature will be provided on the course page on Moodle
<b>Attendance</b>	Mandatory
<b>Comments</b>	

## Basics of Prosthetics

<b>Degree programme</b>	BBE
<b>Semester</b>	4
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Introduction to the basic principles of protection
<b>Teaching methods</b>	
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- to name the causes and level of amputation.</li> <li>- Describe different fitting options.</li> <li>- To select materials for prostheses and orthoses.</li> <li>- Orthopaedic products and their specifications for describe.</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Causes of amputation</li> <li>- Representation of the supply process</li> <li>- Amputation level</li> <li>- Materials in orthopaedic technology</li> <li>- Mechanics and biomechanics in orthopaedic technology</li> <li>- Supply options related to Amputation level</li> <li>- Shaft connection</li> </ul>
<b>Prerequisites</b>	
<b>Assessment Methods</b>	
<b>Recommended Reading and Material</b>	
<b>Attendance</b>	
<b>Comments</b>	

## Computational Bioanalysis

<b>Degree programme</b>	BBE
<b>Semester</b>	4
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	2.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Fundamentals of computational bioanalysis
<b>Teaching methods</b>	
<b>Learning outcome</b>	After passing this course successfully students are able to ... - search literature databases with regard to certain criteria. - perform basic sequence comparisons at DNA and protein level - create protein structures in 3D. - analyze gene expression data sets.
<b>Course contents</b>	- Literature databases - Sequence comparisons (BLAST) on protein and DNA level - Protein Prediction Tools - protein structures - Gene Enrichment Analysis, gene expression data sets
<b>Prerequisites</b>	
<b>Assessment Methods</b>	
<b>Recommended Reading and Material</b>	
<b>Attendance</b>	
<b>Comments</b>	

## Molecular Genetics

<b>Degree programme</b>	BBE
<b>Semester</b>	4
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	The lecture Molecular Genetics provides an overview of the structure and functions of prokaryotes and eukaryotic cells. Molecular mechanisms in prokaryotic and eukaryotic cells are presented, focusing on relevant properties of proteins, RNA and DNA, and the fundamental biological processes of replication, transcription and translation, and regulation of gene expression.
<b>Teaching methods</b>	e-learning units on the respective topics with voluntary self-checks, supporting online teaching material (videos, animations simulations), classroom units with discussion of the topics, and group work with subsequent joint discussion of the results.
<b>Learning outcome</b>	After passing this course successfully students are able to ... - general molecular mechanisms in pro- and eukaryotic cells and compare them. - explain the fundamental biological processes of replication, transcription and translation at the molecular genetic level - reflect the different biological properties of proteins, RNA and DNA - explain the molecular interactions that control gene expression
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Introduction and basics of molecular genetics</li> <li>- Cell cycle and mitosis/replication</li> <li>- Sexual reproduction and meiosis/recombination</li> <li>- Transcription</li> <li>- Translation</li> <li>- Genetics of bacteria</li> <li>- gene regulation</li> </ul>
<b>Prerequisites</b>	ILV Biochemie und Molekularbiologie (BIOMO)
<b>Assessment Methods</b>	- written final exam (80% of final grade), groupworks in class (20% of final grade)
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Molekulare Genetik - Rolf Knippers, Thieme Verlag</li> <li>- Genetik - Allgemeine Genetik - Molekulare Genetik - Entwicklungsgenetik - Wilfried Janning; Elisabeth Knust, Thieme Verlag</li> </ul>
<b>Attendance</b>	There is a general requirement of 75% attendance. No reasons need to be proven or made credible for absenteeism within the remaining 25% (tolerance limit).
<b>Comments</b>	

## Telemedicine & eHealth

<b>Degree programme</b>	BBE
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<b>Semester</b>	4
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Introduction to telemedicine and eHealth
<b>Teaching methods</b>	
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- to classify existing systems or systems planned for the future according to different classification systems.</li> <li>- to identify the different types and essential characteristics of data storage, networks and transmission technologies in the health care sector and to analyse their technical properties and performance criteria.</li> <li>- understand the concept and the different levels of interoperability in the health care system and explain which standards can be used at which level.</li> <li>- Relate and balance the benefits and risks of healthcare ICT applications.</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Introduction and definition of terms: eHealth, mHealth, pHealth, telemedicine</li> <li>- Healthcare challenges and eHealth solutions</li> <li>- Basic technologies (networks, mobile and wireless)</li> <li>- Legal and health policy General conditions</li> <li>- Interoperability and standards</li> <li>- The Electronic Health Record / ELGA</li> <li>- Patient-centred care (home, health and telemonitoring)</li> <li>- Information and communication technology in the biomedical research</li> <li>- Future aspects and resources for a deepening of the Field of expertise</li> </ul>
<b>Prerequisites</b>	
<b>Assessment Methods</b>	
<b>Recommended Reading and Material</b>	
<b>Attendance</b>	

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## Data Management in Medicine

Degree programme	BBE
Semester	4
Course methods	LAB
Language	English
ECTS Credits	2.00
Incoming places	Limited

Course description	Basics of medical data management
Teaching methods	
Learning outcome	After passing this course successfully students are able to ... - List and explain common data formats for medical data - Balance the basic data exchange mechanisms - to save sample data sets accordingly
Course contents	- medical data formats - Storage systems in hospitals - Data storage of medical data
Prerequisites	
Assessment Methods	
Recommended Reading and Material	
Attendance	
Comments	

## Engineering Heart, Lung and Circulation

Degree programme	BBE
Semester	4
Course methods	ILV
Language	English
ECTS Credits	5.00
Incoming places	Limited

<b>Course description</b>	Introduction to technology and definition of heart, lung and circulation technology
<b>Teaching methods</b>	
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- select suitable methods for measuring pressure and flow in the lungs and circulation for given issues and justify this selection.</li> <li>- compare different methods for ECG acquisition and detect and eliminate signal interference.</li> <li>- to describe the essential components of pacemakers and to name and justify the settings for different heart diseases.</li> <li>- to describe the sequence of spirometric and oxymetric examinations and to discuss the possibilities and limitations of measurement methods used.</li> <li>- to name the essential aspects for the electrical safety of a given measurement setup and to identify problems.</li> <li>- to perform simple risk analyses of devices for circulatory and pulmonary medicine.</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Fundamentals of fluid mechanics with regard to the flows in the circulation and lungs</li> <li>- Pressure measuring method: Invasive, non-invasive</li> <li>- Flux measurement method: Invasive, non-invasive</li> <li>- ECG: Conclusion, most important pathophysiological Phenomena, derivations, basic circuits</li> <li>- Spirometry, oximetry</li> <li>- Cardiac pacemakers: basics, components, Operating modes</li> <li>- Safety technology in devices and installation with specific aspects of cardiac safety</li> <li>- Applied risk analysis for cardiovascular devices Lung Medicine</li> </ul>
<b>Prerequisites</b>	
<b>Assessment Methods</b>	
<b>Recommended Reading and Material</b>	
<b>Attendance</b>	
<b>Comments</b>	

## Medical Data Engineering 1

<b>Degree programme</b>	BBE
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<b>Semester</b>	4
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Inter-semester project (together with the course "Medical Data Engineering 2
<b>Teaching methods</b>	
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- to design software for the health care system which could be used by service facilities of the Health Information Network (GIN, Austrian eCard System, electronic insurance card).</li> <li>- to generate structured data from the medical sector and to process them, similar to the CDA findings from the Austrian health file ELGA, and the eCard services</li> <li>- Design database applications for the health care sector and perform simple database transactions.</li> <li>- to apply the basic rules of scientific work when writing and analysing texts, distinguishing a scientific approach from a non-scientific (everyday) one</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Health Information Network (GIN)</li> <li>- Software development for the health sector</li> <li>- Structured data in the health sector</li> </ul>
<b>Prerequisites</b>	
<b>Assessment Methods</b>	
<b>Recommended Reading and Material</b>	
<b>Attendance</b>	
<b>Comments</b>	

## Circuit Design & Signal Analysis

<b>Degree programme</b>	BBE
<b>Semester</b>	4
<b>Course methods</b>	ILV

<b>Language</b>	English
<b>ECTS Credits</b>	5.00
<b>Incoming places</b>	Limited

<b>Course description</b>	This lecture aims to give an introduction to circuit design and to build simple circuits for measuring biosignals. On the other hand the analysis of the self-recorded signals is discussed
<b>Teaching methods</b>	
<b>Learning outcome</b>	After passing this course successfully students are able to ... - analyse passive networks for DC and AC input signals. - Dimensioning of a simple amplifier for bioelectric signal. - Design and evaluation of electronic circuits. - graphical description of analog input stages and active filter.
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- passive electronic components</li> <li>- AC and DC analysis of linear network</li> <li>- Complex signal analysis</li> <li>- ESD protection in the biomedical field</li> <li>- Operational amplifier circuits: Amplifier and Filter circuits</li> <li>- Instrumentation amplifier for bioelectric</li> <li>- Single and dual voltage supplies for analogue/digital circuits</li> <li>- Guidelines for verification of electronic Circuits</li> <li>- Design and evaluation of a biosignal amplifier</li> </ul>
<b>Prerequisites</b>	
<b>Assessment Methods</b>	
<b>Recommended Reading and Material</b>	
<b>Attendance</b>	
<b>Comments</b>	

## Immunology

<b>Degree programme</b>	BBE
<b>Semester</b>	4
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	2.00



<b>Incoming places</b>	Limited
<b>Course description</b>	Introduction to Immunology
<b>Teaching methods</b>	Self-study and Team work in class, student-centered learning, presentations of the group works
<b>Learning outcome</b>	After passing this course successfully students are able to ... <ul style="list-style-type: none"> <li>- explain basic relationships of immunological interactions.</li> <li>- classify the innate and adaptive immune system.</li> <li>- theoretically distinguish bacterial and viral infections.</li> <li>- explain basic mechanisms of allergies and autoimmune diseases</li> <li>- explain the principle and challenges of transplantation.</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- lymphoid organs and their function</li> <li>- innate and adaptive immune system</li> <li>- viral and bacteriel infection</li> <li>- inflammation reactions</li> <li>- allergy, autoimmune diseases, transplantation</li> </ul>
<b>Prerequisites</b>	Knowledge from ANAT, CCT and INSTR about cells and antibodies
<b>Assessment Methods</b>	- 10% active in-class participation (questions and presentation), 15% summary of the Mini-Review (has to be positive), 75% final moodle exam (has to be positive)
<b>Recommended Reading and Material</b>	- K. Murphy and C. Weaver, "Janeway´s Immunobiology," 9th Edition, New York, NY, Garland Science/Taylor & Francis, 2017
<b>Attendance</b>	75% attendance is compulsory.
<b>Comments</b>	

## Cancer Drugs & Therapies

<b>Degree programme</b>	BBE
<b>Semester</b>	4
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited
<b>Course description</b>	This course deals with the differences between normal and tumor cells, how tumor cells can be targeted, how the body acts on drugs,

	about the relationship between drug concentration and pharmacological effect, and how patient and tumor factors are taken into account in personalized therapy approaches.
<b>Teaching methods</b>	Self-study phases and class units alternate. In self-study, content is developed using literature and with the help of questionnaires, videos and self-checks; in the presence phase, in-depth content is presented, discussed and worked on in group work.
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- Outline the development of tumors on a molecular and cellular level and enumerate the characteristics of tumors described by Hanahan and Weinberg.</li> <li>- Propose solutions based on bioassays for questions in the field of tumor biology.</li> <li>- Describe common in vitro and in vivo tumor models and to explain possible applications using examples.</li> <li>- Explain the categories of pharmacokinetics and essential parameters of pharmacodynamics and outline the essential steps to the production of pharmaceuticals.</li> <li>- Perform simple calculations with pharmacokinetic parameters (e.g. bioavailability, volume of distribution, clearance).</li> <li>- Distinguish between acute and chronic toxicity, explain different types of toxic responses and dose-response curves, and give examples of different types of toxins.</li> <li>- Compare traditional chemotherapy, gene therapy and cell-based treatment options in oncology and to explain the underlying molecular mechanisms of action using selected examples.</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Tumor assays</li> <li>- Tumor models</li> <li>- Pharmacokinetics and pharmacodynamics</li> <li>- Toxicology</li> <li>- Traditional cancer drugs</li> <li>- Gene- and cell-based therapies</li> </ul>
<b>Prerequisites</b>	Biochemie und MolekularbiologieCell Culture Techniques
<b>Assessment Methods</b>	- Entrance tests, Group work, Final Exam
<b>Recommended Reading and Material</b>	- Kleinsmith: Principles of Cancer Biology, 2014, Pearson
<b>Attendance</b>	There is a general requirement of 75% attendance. No reasons need to be proven or made credible for absenteeism within the remaining 25% (tolerance limit).

Comments	
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## Basics of Circuit Design

Degree programme	BBE
Semester	4
Course methods	LAB
Language	English
ECTS Credits	3.00
Incoming places	Limited

Course description	Introduction to circuit design
Teaching methods	
Learning outcome	After passing this course successfully students are able to ... - explain the basics of circuit design - to mention special features of medical devices - Design basic medical device circuits and to realise prototypes
Course contents	- Circuit design - Safety and construction for electronics in medical devices - Circuit design of medically used Electronic Components
Prerequisites	
Assessment Methods	
Recommended Reading and Material	
Attendance	
Comments	

## Embedded Systems in Medicine

Degree programme	BBE
Semester	4
Course methods	ILV
Language	English
ECTS Credits	2.00
Incoming places	Limited

<b>Course description</b>	Introduction and subsequent project work in the field of "Embedded Systems"
<b>Teaching methods</b>	
<b>Learning outcome</b>	After passing this course successfully students are able to ... - To name and explain the most important units of embedded systems in medical devices - To define the essential requirements for electronics in medical devices - To name and prototype simple medical devices in their components
<b>Course contents</b>	- project work
<b>Prerequisites</b>	
<b>Assessment Methods</b>	
<b>Recommended Reading and Material</b>	
<b>Attendance</b>	
<b>Comments</b>	

## Safety & Communications in Medical Data Engineering

<b>Degree programme</b>	BBE
<b>Semester</b>	4
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	2.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Principles and methods of software development and software testing
<b>Teaching methods</b>	
<b>Learning outcome</b>	After passing this course successfully students are able to ... - To apply standardised methods of software development. - to plan and implement basic software testing tasks. - to implement ISO/IEC 62304, ISO 13485, IEEE 829 from theory into practice. - explain the communication chain of the Continua Health Alliance.

	- implement a client/server connection using the TCP/IP protocol.
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- fundamental test process</li> <li>- V-model</li> <li>- Standards for medical software development</li> <li>- Standards for medical software development</li> <li>- Basics of data communication</li> <li>- IDE Features (Debugging, Unit Tests, ...)</li> </ul>
<b>Prerequisites</b>	
<b>Assessment Methods</b>	
<b>Recommended Reading and Material</b>	
<b>Attendance</b>	
<b>Comments</b>	

## Biomechanics and Ergonomics Laboratory

<b>Degree programme</b>	BBE
<b>Semester</b>	4
<b>Course methods</b>	LAB
<b>Language</b>	English
<b>ECTS Credits</b>	5.00
<b>Incoming places</b>	Limited

<b>Course description</b>	The recording and analysis of human movement is a central element in ergonomics and in the evaluation of the interaction between sports equipment and athletes. In this laboratory exercise, students learn in practical exercises how to handle the most important measuring instruments of biomechanics. They learn how objective data on the human body can be correctly recorded, processed, evaluated and interpreted.
<b>Teaching methods</b>	
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- Use different methods to assess human motion (EMG, force plate, plantar pressure measurement, 2D video analysis)</li> <li>- Explain changes in ground reaction forces due to different walking speeds</li> <li>- Calculate plantar pressure distribution in walking and running</li> </ul>

	<ul style="list-style-type: none"> <li>- Calculate joint angles and velocities based on 2D motion analysis data</li> <li>- Use numerical computing software for basic data analysis</li> <li>- Analyse and display measurement data from different biomechanical measurements</li> <li>- To explain the origin of myoelectric signals, conduct an electromyography on a human subject</li> <li>- to present the mean time and amplitude normalized muscle activity of a cyclic movement.</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Force plates (technical background, application)</li> <li>- Pressure insoles (technical background, application)</li> <li>- 2D motion analysis (setup, calibration, marker tracking)</li> <li>- Data analysis and parameter extraction using MATLAB</li> <li>- Data presentation (diagrams, boxplots, tables) using MATLAB</li> <li>- Surface electromyography</li> <li>- eye tracking</li> </ul>
<b>Prerequisites</b>	
<b>Assessment Methods</b>	
<b>Recommended Reading and Material</b>	
<b>Attendance</b>	
<b>Comments</b>	

## Cell Culture Techniques

<b>Degree programme</b>	BBE
<b>Semester</b>	4
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	2.00
<b>Incoming places</b>	Limited

<b>Course description</b>	This course gives an introduction to cell culture techniques.
<b>Teaching methods</b>	Self-study phases and class units alternate. In self-study, content is developed using literature and with the help of questionnaires, videos and self-checks; in the presence phase, in-depth content is presented, discussed and worked on in group work.

<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- accurately describe the morphology of cells, to explain the origin as well as the advantages and disadvantages of primary and immortalized cells and to compare the requirements of adherent cells and suspension cells.</li> <li>- select suitable media and media additives for the cultivation of mammalian cells, carry out simple calculations to provide the necessary reagents and correctly interpret the course of growth curves.</li> <li>- explain standard techniques of aseptic cultivation of eukaryotic cells in detail, to show possibilities for the detection of contamination and to suggest necessary countermeasures.</li> <li>- determine cell counts and to name bioassays routinely used to record cell viability, apoptosis and proliferation and to describe the principles on which these assays are based.</li> <li>- name possible applications for the use of cells in biotechnology, research and medicine (e.g. virology, drug testing, tissue engineering, gene therapy) and to describe them using specific examples.</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Biology of various cell types</li> <li>- Equipment, basic methods and reagents in a cell culture laboratory</li> <li>- Types of contamination and their specific detection</li> <li>- Basic calculations in the cell culture lab</li> <li>- Cell culture methods in various fields of application</li> </ul>
<b>Prerequisites</b>	Courses: Biochemie und Molekularbiologie, Biochemielabor, Instrumentelle Analytik in der Labormedizin
<b>Assessment Methods</b>	- Entrance tests, Group work, Handout, Final Exam
<b>Recommended Reading and Material</b>	- Freshney's Culture of Animal Cells, Capes Davis & Freshney, 2021, Wiley Blackwell
<b>Attendance</b>	There is a general requirement of 75% attendance. No reasons need to be proven or made credible for absenteeism within the remaining 25% (tolerance limit).
<b>Comments</b>	

## Cell Culture Laboratory

<b>Degree programme</b>	BBE
<b>Semester</b>	4
<b>Course methods</b>	LAB

<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Learning the most important methods and proper use of the equipment used in cell culture
<b>Teaching methods</b>	Independent development of the basics of cell culture techniques, discussion of the course of the laboratory exercise and the experiments, then independent work in cell culture, writing of a laboratory protocol
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- To apply standard techniques of culturing eukaryotic cells under aseptic conditions and to recognize possible contamination in good time in order to take the necessary measures.</li> <li>- to use the equipment required for this, taking into account safety regulations, to recognize possible malfunctions in good time and, if possible, to rectify them yourself.</li> <li>- Prepare reagents and media, label containers adequately and dispose of waste in accordance with legal requirements.</li> <li>- carry out simple tests with cells (e.g. mycoplasma test, cytotoxicity test) according to standard instructions.</li> <li>- to describe and evaluate all the work steps carried out and the microscopic images generated in the process in a comprehensible manner in a written protocol and to critically reflect on the knowledge gained.</li> <li>- to apply the basic rules of scientific work when writing and analyzing texts, and to distinguish a scientific approach from a non-scientific (everyday) approach.</li> <li>- Record work steps and results obtained in a laboratory book.</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Introduction to cell culture methods of eukaryotic cells (thawing, medium change, passages, cell counting, freezing)</li> <li>- Training in handling of cell culture relevant laboratory equipment (incubator, laminar flow workbench, centrifuge, microscope) and reagents</li> <li>- Performance of a mycoplasma test and a cytotoxicity test including evaluation</li> </ul>
<b>Prerequisites</b>	Biochemie und Molekularbiologie
<b>Assessment Methods</b>	- Test, Protocol



<b>Recommended Reading and Material</b>	- Freshney's Culture of Animal Cells, Capes Davis & Freshney, 2021, Wiley Blackwell
<b>Attendance</b>	There is a compulsory attendance of 100%.
<b>Comments</b>	

## Biomedical Signals and Medical Sensors 1

<b>Degree programme</b>	BBE
<b>Semester</b>	4
<b>Course methods</b>	LAB
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	project work in the field of "Biomedical Signals and Medical Sensors"
<b>Teaching methods</b>	
<b>Learning outcome</b>	After passing this course successfully students are able to ... - to simulate and design electronic circuits for biosignal processing - to build electronic circuits experimentally and to test and characterise them with modern measuring instruments. - to design prototypes with CAD/CAM tools on the basis of concrete tasks.
<b>Course contents</b>	- project work
<b>Prerequisites</b>	
<b>Assessment Methods</b>	
<b>Recommended Reading and Material</b>	
<b>Attendance</b>	
<b>Comments</b>	

## Rehabilitation Engineering

<b>Degree programme</b>	BBE
<b>Semester</b>	4
<b>Course methods</b>	ILV

<b>Language</b>	English
<b>ECTS Credits</b>	2.00
<b>Incoming places</b>	Limited

## Signal Acquisition and Analysis

<b>Degree programme</b>	BBE
<b>Semester</b>	4
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	5.00
<b>Incoming places</b>	Limited

## Body Computer Interaction

<b>Degree programme</b>	BBE
<b>Semester</b>	4
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	2.00
<b>Incoming places</b>	Limited

<b>Course description</b>	project work in the field of "human-computer interaction"
<b>Teaching methods</b>	
<b>Learning outcome</b>	After passing this course successfully students are able to ... - to name and distinguish between biosignals - biosignals in order to create control systems for users enable - Prototypical applications using to design and experimentally build biosignals
<b>Course contents</b>	- Biosignals, their detection and differentiation - Evaluation of biosignals - project work
<b>Prerequisites</b>	
<b>Assessment Methods</b>	
<b>Recommended Reading</b>	

<b>and Material</b>	
<b>Attendance</b>	
<b>Comments</b>	

## Business Informatics (BWI)

### Distributed Systems

<b>Degree programme</b>	BWI
<b>Semester</b>	4
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	5.00
<b>Incoming places</b>	Limited

<b>Course description</b>	This course introduces the development of component-based (in particular service-oriented) software systems.
<b>Teaching methods</b>	Lectures, homework / project work and self-study with practical examples and supervised project work
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- implement component-based systems using a selected programming language</li> <li>- implement service-oriented systems using a selected programming language</li> <li>- analyzing existing monolithic systems and converting them into flexible, distributed systems</li> <li>- exchange data asynchronously between (sub)systems using message queues, file transfer, RPC or shared databases</li> <li>- encapsulate data layer functionalities using O/R Mappers and make them available using interfaces</li> <li>- consider and apply design principles in the context of object orientation in the programming process</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Component Based System Engineering</li> <li>- Service-oriented System Components</li> <li>- Various principles of system design</li> <li>- SOA related to system components</li> <li>- UML modeling (component/sequence diagrams)</li> </ul>

<b>Prerequisites</b>	Basics in software development with a selected programming language. Basic knowledge of software architecture.
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Multimodal:</li> <li>- Theoretical assessment (Moodle MC test)</li> <li>- Homework (Coding Hand-Ins)</li> <li>- Project work</li> </ul>
<b>Recommended Reading and Material</b>	- see Moodle
<b>Attendance</b>	mandatory
<b>Comments</b>	

## IT-Based Controlling

<b>Degree programme</b>	BWI
<b>Semester</b>	4
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	In this course, typical internal accounting tasks (cost accounting, financing, controlling) are carried out with the help of software.
<b>Teaching methods</b>	Workshops, Exercises
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- analyse annual financial statement using key business figures</li> <li>- calculate cash flows</li> <li>- apply core concepts of cost accounting (e.g. cost type acc., cost center acc., cost unit acc.)</li> <li>- prepare investment decisions</li> <li>- create a budget</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- state-of-art spreadsheet calculation</li> <li>- practical implementation of internal accounting tasks</li> <li>- business decision calculations</li> </ul>
<b>Prerequisites</b>	ManagementAccountingInvestment & Financing
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- 2 interim tests (25 points)</li> <li>- 1 final exam (50 points)</li> </ul>

<b>Recommended Reading and Material</b>	
<b>Attendance</b>	Mandatory
<b>Comments</b>	

## Smart Homes and Assistive Technologies (BSA)

### Automation Networks

<b>Degree programme</b>	BSA
<b>Semester</b>	4
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	This module gives an introduction to the basics of building automation and smart homes.
<b>Teaching methods</b>	
<b>Learning outcome</b>	After passing this course successfully students are able to ... - explain the basic characteristics of open building automation (e.g. KNX) networks - define the requirements of wired and wireless automation networks - analyze the application areas of open building automation systems and identify their benefits and disadvantages
<b>Course contents</b>	- Requirements, challenges and benefits of wired and wireless automation networks - History, protocol stack, media, interoperability, devices and configuration of wired bussystems (e.g. BACnet, KNX, LonWorks) - Wireless communication in Smart Homes - History, protocol stack, media, interoperability, devices and configuration of wireless bussystems (e.g. Bluetooth, RFID, Z-Wave, EnOcean, KNXRF, ZigBee) - Trade and system spanned integration
<b>Prerequisites</b>	
<b>Assessment Methods</b>	

<b>Recommended Reading and Material</b>	
<b>Attendance</b>	
<b>Comments</b>	

## Renewable Energies (BEE)

### Applied Computer Science

<b>Degree programme</b>	BEE
<b>Semester</b>	4
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	5.00
<b>Incoming places</b>	Limited

<b>Course description</b>	After introducing basic elements of Computer Science (Hardware, Software, networks, development methods and processes) basic programming techniques will be learnt and applied on single-chip-computers.
<b>Teaching methods</b>	
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- explain the structure of a computer</li> <li>- explain the computer architecture and its periphery</li> <li>- compose flow charts</li> <li>- define and formulate a problem statement (from a specification to a computer program)</li> <li>- know and understand the tasks of a programming language</li> <li>- independently code a computer program</li> <li>- handle and apply controlling structures</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Introduction Computer Science</li> <li>- Computer systems, Hardware</li> <li>- Software and its characteristics</li> <li>- Programming paradigms, programming languages and its</li> <li>- Software development, development processes</li> <li>- Basics of computer architectures</li> <li>- Microcontroller vs. Microprocessor</li> </ul>

	<ul style="list-style-type: none"> <li>- Operating Systems</li> <li>- Application examples on Raspberry PI: user interface, file systems, components</li> <li>- Sensor / actuator elements, networks</li> <li>- Basics of Programming</li> <li>- Program sequence</li> <li>- Sequence diagrams – from specification to programs</li> <li>- Data processing – reading, executing, writing of data</li> <li>- Data types</li> <li>- Controlling structures</li> <li>- Data structures</li> <li>- Procedures, functions</li> <li>- Model based development</li> <li>- UML modeling basics</li> <li>- MatLab, Python</li> </ul>
<b>Prerequisites</b>	
<b>Assessment Methods</b>	
<b>Recommended Reading and Material</b>	
<b>Attendance</b>	75 %
<b>Comments</b>	

## Information and Communication Systems and Services (BIC)

### IT Security Basics

<b>Degree programme</b>	BIC
<b>Semester</b>	4
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	The course offers an overview of the fundamentals of IT security and deals with cryptographic methods, authenticity, key management, access control and secure communication.
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<b>Teaching methods</b>	
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- to name the protection goals of IT security and to show threats as well as methods to guarantee the goals</li> <li>- know cryptographic methods and can name their respective strengths and weaknesses and thus possible application scenarios</li> <li>- Encrypt and sign emails and any documents</li> <li>- List methods for access control and monitoring at network, system and application levels and explain their function and application scenarios</li> <li>- Can explain basic technologies for secure communication</li> <li>- Explain basic procedures for evaluating the importance of systems or for risk analysis</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Basics of Information Security</li> <li>- Threat to IT security and sources of danger (internal and external threats)</li> <li>- Basics of cryptography</li> <li>- HMAC</li> <li>- Public key infrastructures (PKI)</li> <li>- Signatures</li> <li>- Certificates</li> <li>- access control</li> <li>- Identification/Authentication/Authorization</li> <li>- Password security/entropy</li> <li>- DMZ, Firewall &amp; IDS/IPS</li> <li>- IPSec</li> <li>- Transport Layer Security</li> <li>- Secure communication mechanisms</li> </ul>
<b>Prerequisites</b>	
<b>Assessment Methods</b>	
<b>Recommended Reading and Material</b>	
<b>Attendance</b>	
<b>Comments</b>	

## Software Security

<b>Degree programme</b>	BIC
<b>Semester</b>	4



<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	2.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Software security is the umbrella term for software designed to continue to function properly in the face of malicious attacks. Security as part of the software development process is an ongoing process involving people and processes that ensures the confidentiality, integrity and availability of the application. Secure software is the result of security conscious software development processes where security is built in and therefore software is developed with security in mind
<b>Teaching methods</b>	
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- Establish identity &amp; access management in (web) applications</li> <li>- Recognize the 10 most common security vulnerabilities in software</li> <li>- Use established authentication methods (HTTP Digest, Single Sign On/SAML/OAuth2)</li> <li>- Development of secure applications and assessment of current security risks</li> <li>- Evaluate software projects using a Secure Software Lifecycle</li> <li>- Assessment of threats to applications using a risk matrix</li> <li>- Basics for conducting a security assessment / pentest</li> <li>- Software development: Secure by design, secure by default</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Application Security</li> <li>- Secure by design principles</li> <li>- Secure authentication in SW</li> <li>- Web Application Security</li> <li>- Identity &amp; Access Management</li> <li>- Risikobewertung in SW / Threat Modeling</li> <li>- DB Security</li> </ul>
<b>Prerequisites</b>	<p>Knowledge of common web languages (HTML, JS, CSS, PHP, AJAX) Knowledge of object-oriented languages (Java    C#. / .net) Knowledge of handling databases (MySQL or Oracle) Basic knowledge of using Linux Knowledge of network protocols: Ethernet, IP/ARP, TCP/UDP, DNS, Application Layer protocols, Transport Layer Security or http/s, s/ftp, ssh,...</p>

<b>Assessment Methods</b>	
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- SAML Specifications 2.1</li> <li>- OAuth 2.0 Authorization Framework - RFC6749</li> <li>- OWASP 10 2021++/--</li> <li>- NIST Secure Software Development Framework</li> <li>- OWASP Secure Coding Guideline</li> </ul>
<b>Attendance</b>	
<b>Comments</b>	

## Embedded Systems

<b>Degree programme</b>	BIC
<b>Semester</b>	4
<b>Course methods</b>	LAB
<b>Language</b>	English
<b>ECTS Credits</b>	5.00
<b>Incoming places</b>	Limited

<b>Course description</b>	This module deals with the development and implementation of sophisticated software projects, based on Embedded Systems and corresponding communication modules.
<b>Teaching methods</b>	
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- Implement sophisticated communication modules of Embedded Systems (Bluetooth, Wifi, ZigBee, Ethernet, USB, ...)</li> <li>- Utilize existing communication module stacks/software libraries</li> <li>- Record and analyze communication protocols</li> <li>- Implement assignments either based on stand-alone firmware or based on pre-configured Embedded OSs (e.g. Embedded Linux)</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Description of basic concepts for embedded operating systems (e.g. Embedded Linux)</li> <li>- Implementation and description of various sophisticated embedded communication interfaces (e.g. USB, Bluetooth, Wifi, Ethernet, ZigBee, ...)</li> <li>- Implementation of one or more assignments based on embedded hardware platforms (utilizing existing embedded libraries)</li> <li>- Recording and analyzation of data transfers of the embedded</li> </ul>

	communication interfaces, in order to understand the dataflow and the debugger - Implementation of a project based on the course contents
<b>Prerequisites</b>	
<b>Assessment Methods</b>	
<b>Recommended Reading and Material</b>	
<b>Attendance</b>	
<b>Comments</b>	

## Business English

<b>Degree programme</b>	BIC
<b>Semester</b>	2
<b>Course methods</b>	UE
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	In this course, you will learn some of the key aspects of business communication in English, as well as the key processes and activities of starting a business. This includes figuring out what kind of organization your business should be, how best to market your product, and what considerations you should make about sustainability issues - an increasingly important topic. You will also discover important communication tools in business environments such as meetings, learn how to write clear and compelling reports, and how to use innovative presentation methods to engage your audience.
<b>Teaching methods</b>	Small and medium scale assignments and activities; open-ended assignments and group discussion; individual assignments; peer review and discussion.
<b>Learning outcome</b>	After passing this course successfully students are able to ... - Use business vocabulary in relation to various aspects of business communication - Use functional language in various business situations, such as meetings

	<ul style="list-style-type: none"> <li>- Describe financial data</li> <li>- use specific vocabulary and terminology in, for example, leading a meeting</li> <li>- Understand and apply key marketing concepts and related language Business reports</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Business reports</li> <li>- Describe and present visual data</li> <li>- Communicating in a variety of business situations</li> <li>- Presentation in business English</li> </ul>
<b>Prerequisites</b>	English at level B2 of the Common European Framework of Reference for Languages
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Presentation: 50%</li> <li>- Self-study tasks: 20%</li> <li>- Written report task: 30%</li> </ul>
<b>Recommended Reading and Material</b>	- All required literature will be provided on the course page on Moodle
<b>Attendance</b>	Obligatory
<b>Comments</b>	None

## Computer Science (BIF)

### Software Engineering 2 Labor

<b>Degree programme</b>	BIF
<b>Semester</b>	4
<b>Course methods</b>	LAB
<b>Language</b>	English
<b>ECTS Credits</b>	5.00
<b>Incoming places</b>	Limited

<b>Course description</b>	<p>The course is an introduction to UI development in Java or C# .NET. The main focus is on the separation between the user interface (graphically) and the appropriate code for controlling it. In professional software development environments, it is not sufficient to just write working code. It is important to structure the code in a comprehensible way considering standard patterns and documentation principles. By respecting the concepts of this lecture</p>
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	we improve the overall quality, the readability, traceability, expandability and interchangeability. You can choose between C# and Java for the development process during the full course.
<b>Teaching methods</b>	The theory part consists of self-study phases, Moodle Tests and attendance. The practical part is a course project in which all learned content is applied.
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- implement a graphical user interface with the help of WPF or JavaFX</li> <li>- use a logging library to document and track runtime behavior of an application</li> <li>- create simple reports with tables and images using a PDF library</li> <li>- design and implement loosely coupled classes and interfaces</li> <li>- plan the deployment of an application and identify possible critical paths</li> <li>- use LINQ or Java Streams to implement functional programming concepts</li> <li>- consider SOLID principles during development of object-oriented software</li> <li>- detect, name and extend design patterns after Erich Gamma in object oriented software</li> <li>- reproduce visual modeling basics that include modeling goals and the concepts of object orientation</li> <li>- model class diagrams to visualize the classes of a software system and their relationships, as well as their behavior and properties</li> <li>- model sequence and communication diagrams to represent communication between classes</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Introduction to application analysis and design</li> <li>- Design patterns</li> <li>- S.O.L.I.D. Principles</li> <li>- Basics of visual modeling (UML)</li> <li>- Class diagrams</li> <li>- Sequence and communication diagrams</li> </ul>
<b>Prerequisites</b>	Knowledge for object-oriented development, database integration and integration of unit tests in C# or Java is required.
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Moodle Tests</li> <li>- Presentations</li> <li>- Semester project</li> </ul>
<b>Recommended Reading and Material</b>	- C#: <a href="https://docs.microsoft.com/en-us/visualstudio/designers/getting-started-with-wpf">https://docs.microsoft.com/en-us/visualstudio/designers/getting-started-with-wpf</a>

	<ul style="list-style-type: none"> <li>- C#: <a href="http://han.technikum-wien.at/han/ebookcentral/ebookcentral.proquest.com/lib/ftw/detail.action?docID=5327214">http://han.technikum-wien.at/han/ebookcentral/ebookcentral.proquest.com/lib/ftw/detail.action?docID=5327214</a></li> <li>- C#: <a href="https://www.syncfusion.com/succinctly-free-ebooks/wpf-succinctly">https://www.syncfusion.com/succinctly-free-ebooks/wpf-succinctly</a></li> <li>- Java: <a href="https://openjfx.io/">https://openjfx.io/</a></li> <li>- Java: <a href="https://link-1.springer-1com-1000342kv0273.han.technikum-wien.at/book/10.1007/978-3-658-02836-7">https://link-1.springer-1com-1000342kv0273.han.technikum-wien.at/book/10.1007/978-3-658-02836-7</a></li> <li>- Java: <a href="https://link-1.springer-1com-1000342we0744.han.technikum-wien.at/book/10.1007/978-3-658-30494-2">https://link-1.springer-1com-1000342we0744.han.technikum-wien.at/book/10.1007/978-3-658-30494-2</a></li> <li>- Material (Slides, Videos, selected Articles) via Moodle</li> </ul>
<b>Attendance</b>	mandatory
<b>Comments</b>	

## Innovation Lab 2

<b>Degree programme</b>	BIF
<b>Semester</b>	4
<b>Course methods</b>	PRJ
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	The course is a project course in which technologies and competencies that have been learned in other courses are combined and applied. Project proposals are made available by the degree program. The duration of the projects is between 1 and 3 semesters. By continuing a project through the entire InnoLab series (InnoLab 1 to 3), students have the opportunity to fully implement larger projects.
<b>Teaching methods</b>	project work
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- Implement requirements in a team and transform them into an operational IT system</li> <li>- plan and coordinate a project in small groups</li> <li>- work in teams and to coordinate tasks</li> <li>- to present project results in front of colleagues and to argue possible solutions</li> </ul>
<b>Course contents</b>	- Practical deepening of the content of other courses in a project

<b>Prerequisites</b>	All courses of previous semesters
<b>Assessment Methods</b>	- Project results
<b>Recommended Reading and Material</b>	- depending on project
<b>Attendance</b>	partly
<b>Comments</b>	The supervision is done on an individual basis in synchronous or asynchronous settings and is supported by modern communication tools.

## Requirements Engineering

<b>Degree programme</b>	BIF
<b>Semester</b>	4
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	2.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Requirements define the Needs of customers and stakeholders in a formalized way, so that the Features of a product can be implemented correctly (Needs<-->Requirements<-->Features). Requirements engineering is the process of elicitation, documentation, verification and management of requirements. Insufficient requirements engineering can lead to high follow-up costs (check Berlin Airport, <a href="https://www.engineering.com/story/germanys-ghost-airport-berlins-brandenburg">https://www.engineering.com/story/germanys-ghost-airport-berlins-brandenburg</a> ). In this course you will learn the basics of requirements engineering in both classic and agile project environments. In doing so, emphasis is placed on both the theoretical basics and the practical application. After successfully completing this course, you will be able to comprehensively collect requirements, document them correctly and follow them up in practice.
<b>Teaching methods</b>	integrated course, flipped classroom principle
<b>Learning outcome</b>	After passing this course successfully students are able to ... <ul style="list-style-type: none"> <li>- justify the need for requirements engineering</li> <li>- carry out requirements elicitation as appropriate</li> <li>- carry out requirements documentation correctly</li> </ul>

	<ul style="list-style-type: none"> <li>- correctly document requirements based on models</li> <li>- define and manage requirements in agile project settings</li> <li>- develop SW according to the BDD approach (Behavior-Driven-Development)</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Requirements Engineering basics</li> <li>- Requirements documentation and modeling</li> <li>- Agile requirements engineering</li> <li>- User Story mapping</li> <li>- Behavior-Driven-Development</li> </ul>
<b>Prerequisites</b>	none
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Knowledge tests</li> <li>- learning assignments</li> <li>- final exam</li> </ul>
<b>Recommended Reading and Material</b>	- Requirements Engineering Fundamentals: A Study Guide for the Certified Professional for Requirements Engineering Exam Foundation Level – IREB compliant, 2nd Edition
<b>Attendance</b>	mandatory
<b>Comments</b>	Flipped Classroom Concept: preparatory literature study - assignments- 3 x 4h class-room units - final exam

## Computer Science Seminar

<b>Degree programme</b>	BIF
<b>Semester</b>	4
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	5.00
<b>Incoming places</b>	Limited

<b>Course description</b>	<p>In this integrated course the focus is on developing and implementing didactic knowledge and concepts in the field of eLearning and eDidactics. Examples in the courses serve as an introduction to the topic. Feedback loops from other students (peer review – critical friend feedback) and the course supervisors allow a didactically valuable implementation. During the semester a Moodle course is didactically developed - therefore an eCourse concept is elaborated, an introduction "icebreaker" is planned, a teaching video</p>
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	is shot and learning assignments are created. For this purpose, groups are formed to work together on a computer science topic proposed by the degree program. The classes show methods to prepare the content according to the learning outcomes.
<b>Teaching methods</b>	integrated course
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- show and reflect the possibilities, range and limits of the application of eLearning.</li> <li>- reproduce the most important terms in eLearning.</li> <li>- describe which eDidactic methods can be used to implement it in an eCourse.</li> <li>- develop problems and feedback in an eLearning context.</li> <li>- use eLearning tools and feedback for content and application development.</li> <li>- design, implement and critically evaluate learning packages.</li> <li>- plan, implement and evaluate video trainings.</li> <li>- familiarize yourself with a new topic in computer science.</li> <li>- establish a connection between the new topics and practice.</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Familiarization with a (new) topic and implementing a didactic e-learning concept in Moodle</li> <li>- Introduction eLearning &amp; eDidactics</li> <li>- eLearning Tools &amp; Moodle Basics</li> <li>- Icebreakers &amp; Video Trainings</li> <li>- Video Trainings &amp; Content Management</li> <li>- Learning Assessments</li> <li>- Finalisation Learning Package</li> </ul>
<b>Prerequisites</b>	All courses of previous semesters User knowledge Moodle
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- 20% eCourse Concept</li> <li>- 50% implementation</li> <li>- 10% CFF</li> <li>- 10% presentation</li> <li>- 10% Lerntagebuch</li> </ul>
<b>Recommended Reading and Material</b>	- depending on chosen topic
<b>Attendance</b>	Attendance is required
<b>Comments</b>	-

## Data Science und Machine Learning

<b>Degree programme</b>	BIF
<b>Semester</b>	4
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	5.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Data Scientist 1/3
<b>Teaching methods</b>	integrated course
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- prepare, visualize and evaluate structured databases using Excel and Tableau.</li> <li>- read a data set into an IPython notebook, processing it in this development environment and exploring it using descriptive statistics and selected statistical methods.</li> <li>- recognize relationships between a dependent and one or more independent variables and use regression methods to develop a prediction model.</li> <li>- classify data points in the multi-dimensional feature space with the help of simple and monitored learning processes (nearest neighbors, decision trees).</li> <li>- evaluate and improve the performance of classification and regression processes.</li> <li>- cluster data points in the multi-dimensional feature space using the kMeans method and to determine the optimal number of clusters.</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Data preparation, visualization and evaluation</li> <li>- Use of Python in data science</li> <li>- Regression analysis</li> <li>- Time series regression</li> <li>- classification</li> <li>- Performance evaluation and improvement</li> <li>- Cluster and principal component analysis</li> </ul>
<b>Prerequisites</b>	
<b>Assessment Methods</b>	
<b>Recommended Reading and Material</b>	
<b>Attendance</b>	

Comments	
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## Android App Development

Degree programme	BIF
Semester	4
Course methods	ILV
Language	English
ECTS Credits	5.00
Incoming places	Limited

Course description	Smartphones, tablets and other mobile devices along with associated apps and services have had a disruptive impact on our society. More and more applications migrate from a classic desktop environment to mobile platforms. This allows for better integration into daily routines and thus enables the support for new use cases. As a consequence, there is a high demand for specialists in the area of mobile computing and mobile app development which are able to implement these use cases. In terms of market share, Android is the largest mobile operating. It powers devices from a large number of different manufactures and different formfactors. Google provides an extensive toolkit for developing Android apps which is constantly evolving and expanding. As a result, knowing and understanding this toolkit, its building blocks and the associated concepts is required if you want to develop native Android applications. Furthermore it helps you to understand the technical possibilities and limitations of such apps and allows for identifying and evaluating innovation potential.
Teaching methods	Theoretical preparation, as well as in-depth exercises in the self-study phases. Group discussions and joint practical examples in the attendance phases.
Learning outcome	After passing this course successfully students are able to ... <ul style="list-style-type: none"> <li>- develop advanced Android applications using the current development tools and IDEs</li> <li>- name and explain advanced design patterns and best practices for developing Android applications</li> <li>- structure and build your own Android application implementations according to these design patterns and best practices</li> </ul>
Course contents	- Developing smartphone applications for Android

	<ul style="list-style-type: none"> <li>- Design patterns for Android applications</li> <li>- Basics of the Kotlin programming language</li> <li>- Android application design (structuring and developing UI-code, threading, asynchronous web requests, data persistence)</li> <li>- Pitfalls and best practices (memory management, debugging, crash-logs, performance optimization)</li> </ul>
<b>Prerequisites</b>	Basics of programming in an object-oriented language
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Assignments Part (75 %) 6 Assignments 100 (per assignment)</li> <li>- Theoretical Part (25 %) Theory test 100</li> </ul>
<b>Recommended Reading and Material</b>	- see Moodle course for each attendance and self-study phase
<b>Attendance</b>	see program guidelines
<b>Comments</b>	

## Business English

<b>Degree programme</b>	BIF
<b>Semester</b>	4
<b>Course methods</b>	UE
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	In this course, you will learn some of the key aspects of business communication in English, as well as the key processes and activities of starting a business. This includes figuring out what kind of organization your business should be, how best to market your product, and what considerations you should make about sustainability issues - an increasingly important topic. You will also discover important communication tools in business environments such as meetings, learn how to write clear and compelling reports, and how to use innovative presentation methods to engage your audience.
<b>Teaching methods</b>	Small and medium scale assignments and activities; open-ended assignments and group discussion; individual assignments; peer review and discussion.
<b>Learning outcome</b>	After passing this course successfully students are able to ...

	<ul style="list-style-type: none"> <li>- Use business vocabulary in relation to various aspects of business communication</li> <li>- Use functional language in various business situations, such as meetings</li> <li>- Write a business report</li> <li>- Describe financial data</li> <li>- Understand and apply key marketing concepts and related language Business reports</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Business reports</li> <li>- Describe and present visual data</li> <li>- Communicating in a variety of business situations</li> <li>- Presentation in business English</li> </ul>
<b>Prerequisites</b>	English at level B2 of the Common European Framework of Reference for Languages
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Presentation: 50%</li> <li>- Self-study tasks: 20%</li> <li>- Written report task: 30%</li> </ul>
<b>Recommended Reading and Material</b>	- All required literature will be provided on the course page on Moodle
<b>Attendance</b>	Mandatory
<b>Comments</b>	

## Continuous Integration

<b>Degree programme</b>	BIF
<b>Semester</b>	4
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	5.00
<b>Incoming places</b>	Limited

<b>Course description</b>	<p>The integration of Continuous Integration (CI) in general and tooling support through suitable CI servers has meanwhile become standard in the software development industry in many companies. Therefore, knowledge of software development is required and assumed. In addition, the integration of CI solutions in software products has the advantage that software can be delivered faster and with fewer</p>
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	errors. In this course, knowledge in the field of CI is imparted using common CI servers. This includes the presentation of relevant CI servers such as Jenkins, GitHub Actions, GitLab CI, Circle CI, and Azure DevOps as well as the implementation of your own CI pipeline with 2 different CI servers. The architecture and design principles used at the CI Server are learned and applied by implementing a CI Pipeline for a web application.
<b>Teaching methods</b>	Integrated course. Lectures, homework/project work, self-study with practical examples, and supervised project work.
<b>Learning outcome</b>	After passing this course successfully students are able to ... <ul style="list-style-type: none"> <li>- apply the principles of semantic versioning to your own software projects</li> <li>- to set up a CI server</li> <li>- translate and test existing software on the CI server, build suitable packages and roll them out on the target system</li> <li>- understand the need to merge development and operations</li> <li>- to know the methods and processes of an optimized cooperation between development and operation</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Semantic versioning and specialization in Git</li> <li>- Understand the motivation for CI</li> <li>- Set up and configure CI server (Jenkins)</li> <li>- Set up build jobs and build pipelines on the CI server</li> <li>- Use build tools (Ant, Maven, Gradle)</li> <li>- Set up and use other tools (Docker, SonarQube, Artifactory)</li> <li>- Application-release automation</li> <li>- Organizational and economic framework of DevOps</li> </ul>
<b>Prerequisites</b>	Experience in software development, including project implementation. Basic experience in software testing. Basics of version control with Git.
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- 2 x Moodle Multiple Choice Test (2 x 25%)</li> <li>- 1 x Semester Project (50%)</li> </ul>
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Ian Sommerville: Engineering Software Products. An introduction to modern software engineering (Pearson)</li> <li>- Humble, Farley: Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation</li> </ul>
<b>Attendance</b>	mandatory
<b>Comments</b>	

## Network Security

<b>Degree programme</b>	BIF
<b>Semester</b>	4
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	in this course you will learn security aspects in networks (technology classification, OSI security architecture, TCP/IP security challenges, tunneling protocols according OSI layers, mechanisms and applications, WLAN security, security of network services and web applications), firewall technologies, intrusion detection & prevention systems and network segmentation.
<b>Teaching methods</b>	integrated course, flipped classroom principle
<b>Learning outcome</b>	After passing this course successfully students are able to ... - list requirements for secure communication (networks, services, distributed applications) and describe the procedures and protocols required for this purpose, - know the different categories of IDS/IPS network devices and explain their advantages and disadvantages, - know the different categories of perimeter security devices and explain the differences, - know methods to secure simple networks, wired as well as wireless.
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Physical Security</li> <li>- Secure Network Design</li> <li>- Secure Site Connections</li> <li>- IDS/IPS - Intrusion Detection &amp; Prevention Systems</li> <li>- Secure Protocols (SSH, TLS, IPsec...)</li> <li>- 802.1x and Access Control</li> <li>- Authentication</li> <li>- DDOS mitigation</li> </ul>
<b>Prerequisites</b>	Fundamentals of Computer ScienceIT Network fundamentalsOperating Systems Basics (Windows, Linux)
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Practical exercises</li> <li>- Final Exam (theory)</li> </ul>
<b>Recommended Reading</b>	- Cryptography and Network Security: Principles and Practice, Global

<b>and Material</b>	Edition – William Stallings (2016) - Network Security Essentials: Applications and Standards, Global Edition – William Stallings (2016) - IT-Sicherheit für TCP/IP- und IoT-Netzwerke: Grundlagen, Konzepte, Protokolle, Härtung – Steffen Wendzel (2021) - IT-Sicherheit Konzepte – Verfahren – Protokolle – Claudia Eckert (2018)
<b>Attendance</b>	Mandatory.
<b>Comments</b>	

## System Hardening

<b>Degree programme</b>	BIF
<b>Semester</b>	4
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	2.00
<b>Incoming places</b>	Limited

<b>Course description</b>	In this course you learn security basics of operating systems as well as threats, defense mechanisms and hardening of operating systems (specifics of Windows and Linux).
<b>Teaching methods</b>	integrated course, flipped classroom principle
<b>Learning outcome</b>	After passing this course successfully students are able to ... - explain the need for secure systems, - identify basic methods for securing operating systems, - reflect different tasks of security measures of operating systems.
<b>Course contents</b>	- Identity and Access Management - Administration and Remote Management - Windows Server Security - Windows Client Security - Linux Server Security - Linux Client Security - Secure Active Directory - SELinux - AppArmor
<b>Prerequisites</b>	Basics of computer science Basics of IT infrastructure Basics of router



	and switching configuration
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Practical exercises</li> <li>- Final Exam (theory)</li> </ul>
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Mastering Linux Security and Hardening: Protect your Linux systems from intruders, malware attacks and other cyber threats, 2nd edition – Donald A. Tevault (2020)</li> <li>- Mastering Windows Security and Hardening: Secure and protect your Windows environment from intruders, malware attacks and other cyber threats – Mark Dunkerley and Matt Tumbarello (2020)</li> <li>- Practical Linux Security Cookbook – Tajinder Kalsi (2018)</li> </ul>
<b>Attendance</b>	Mandatory.
<b>Comments</b>	

## Software Engineering 2 Labor

<b>Degree programme</b>	BIF
<b>Semester</b>	4
<b>Course methods</b>	LAB
<b>Language</b>	English
<b>ECTS Credits</b>	5.00
<b>Incoming places</b>	Limited

<b>Course description</b>	<p>The course is an introduction to UI development in Java or C# .NET. The main focus is on the separation between the user interface (graphically) and the appropriate code for controlling it. In professional software development environments, it is not sufficient to just write working code. It is important to structure the code in a comprehensible way considering standard patterns and documentation principles. By respecting the concepts of this lecture we improve the overall quality, the readability, traceability, expandability and interchangeability. You can choose between C# and Java for the development process during the full course.</p>
<b>Teaching methods</b>	<p>The theory part consists of self-study phases, Moodle Tests and attendance. The practical part is a course project in which all learned content is applied.</p>
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- implement a graphical user interface with the help of WPF or</li> </ul>

	<p>JavaFX</p> <ul style="list-style-type: none"> <li>- use a logging library to document and track runtime behavior of an application</li> <li>- create simple reports with tables and images using a PDF library</li> <li>- design and implement loosely coupled classes and interfaces</li> <li>- plan the deployment of an application and identify possible critical paths</li> <li>- use LINQ or Java Streams to implement functional programming concepts</li> <li>- consider SOLID principles during development of object-oriented software</li> <li>- detect, name and extend design patterns after Erich Gamma in object oriented software</li> <li>- reproduce visual modeling basics that include modeling goals and the concepts of object orientation</li> <li>- model class diagrams to visualize the classes of a software system and their relationships, as well as their behavior and properties</li> <li>- model sequence and communication diagrams to represent communication between classes</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Introduction to application analysis and design</li> <li>- Design patterns</li> <li>- S.O.L.I.D. Principles</li> <li>- Basics of visual modeling (UML)</li> <li>- Class diagrams</li> <li>- Sequence and communication diagrams</li> </ul>
<b>Prerequisites</b>	<p>Knowledge for object-oriented development, database integration and integration of unit tests in C# or Java is required.</p>
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Moodle Tests</li> <li>- Presentations</li> <li>- Semester project</li> </ul>
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- C#: <a href="https://docs.microsoft.com/en-us/visualstudio/designers/getting-started-with-wpf">https://docs.microsoft.com/en-us/visualstudio/designers/getting-started-with-wpf</a></li> <li>- C#: <a href="http://han.technikum-wien.at/han/ebookcentral/ebookcentral.proquest.com/lib/ftw/detail.action?docID=5327214">http://han.technikum-wien.at/han/ebookcentral/ebookcentral.proquest.com/lib/ftw/detail.action?docID=5327214</a></li> <li>- C#: <a href="https://www.syncfusion.com/succinctly-free-ebooks/wpf-succinctly">https://www.syncfusion.com/succinctly-free-ebooks/wpf-succinctly</a></li> <li>- Java: <a href="https://openjfx.io/">https://openjfx.io/</a></li> <li>- Java: <a href="https://link-1.springer-1com-1000342kv0273.han.technikum-wien.at/book/10.1007/978-3-658-02836-7">https://link-1.springer-1com-1000342kv0273.han.technikum-wien.at/book/10.1007/978-3-658-02836-7</a></li> </ul>

	- Java: <a href="https://link-1.springer-1.com-1000342we0744.han.technikum-wien.at/book/10.1007/978-3-658-30494-2">https://link-1.springer-1.com-1000342we0744.han.technikum-wien.at/book/10.1007/978-3-658-30494-2</a> - Material (Slides, Videos, selected Articles) via Moodle
<b>Attendance</b>	mandatory
<b>Comments</b>	

## Mechatronics/Robotics (BMR)

### Manufacturing Engineering

<b>Degree programme</b>	BMR
<b>Semester</b>	4
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	2.00
<b>Incoming places</b>	Limited

<b>Course description</b>	In this course students acquire basic knowledge in the fields of production engineering according to DIN 8580
<b>Teaching methods</b>	Integrated course
<b>Learning outcome</b>	After passing this course successfully students are able to ... - - to specify essential industrial requirements for manufacturing processes using appropriate technical parameters - - to explain selected manufacturing processes from the main groups mentioned in DIN 8580 with regard to basic physical or chemical principles, typical industrial process steps and devices as well as common industrial applications - - describe a manufacturing process using one or more of these methods by means of the underlying process flow logic (material flow)
<b>Course contents</b>	- - Requirements for industrial manufacturing processes (incl. measured variables) - - Overview of main groups of manufacturing processes (DIN8580)
<b>Prerequisites</b>	Basic knowledge according to admission requirements for the bachelor's program
<b>Assessment Methods</b>	- Participation, Moodle tests and final examination

<b>Recommended Reading and Material</b>	- - Förster, R.; Förster, A.: Einführung in die Fertigungstechnik, Springer Vieweg, 2018
<b>Attendance</b>	75%
<b>Comments</b>	none

## Materials Science

<b>Degree programme</b>	BMR
<b>Semester</b>	4
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Have an insight into the world of materials science! In this course you will get an overview of the most important materials of our everyday life - have an insight into atomic levels, learn what these materials are capable of and what we use them for. Learn to understand why materials behave like they do and establish an understanding about the various material's processing and treatments. We will focus here on metals.
<b>Teaching methods</b>	Integrated course
<b>Learning outcome</b>	After passing this course successfully students are able to ... <ul style="list-style-type: none"> <li>- have a basic understanding of the properties of materials</li> <li>- distinguish between elastic and plastic deformation</li> <li>- to read phase diagrams</li> <li>- have basic understanding about ferrous and non-ferrous metals</li> <li>- have a basic understanding of steelmaking</li> <li>- have a basic understanding of the heat treatments of steel</li> <li>- have a basic understanding of material selection according to Ashby</li> <li>- have a basic understanding of the different methods of material testing</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Classification of Materials</li> <li>- Structures of Materials (Interatomic Bonding, Crystal Structure, Crystal Defects)</li> <li>- Material's Properties</li> <li>- Alloying and Casting</li> </ul>

	<ul style="list-style-type: none"> <li>- Phase Diagrams</li> <li>- Microstructure</li> <li>- Fe-C phase diagram</li> <li>- The Fe-C Phase Diagram</li> <li>- Steelmaking (Blast Furnace, BOP, DRI, Electric Arc furnace,...)</li> <li>- Heat Treatment Process</li> <li>- Designation</li> <li>- Fe-C Categories</li> <li>- Nonferrous Alloys</li> <li>- Materials Testing</li> <li>- Material Selection</li> <li>- Difference between Metals, Polymers, Ceramics</li> <li>-</li> </ul>
<b>Prerequisites</b>	Basic knowledge according to admission requirements for the bachelor's program
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Final Exam</li> <li>- exercises</li> </ul>
<b>Recommended Reading and Material</b>	- - Ashby, M.F.; Jones, D.R.H.: Engineering Materials 1: An Introduction to Properties, Applications and Design, Elsevier, 2011
<b>Attendance</b>	75%
<b>Comments</b>	none

## Human Factors and Sports Engineering (BHF)

### Business English

<b>Degree programme</b>	BHF
<b>Semester</b>	2
<b>Course methods</b>	UE
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	In this Business English course, students will learn how to write clear, compelling, professional text, as well as, expanding their language toolkit to enable them to record and apply business vocabulary and terminology in the context of future trends in
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	Business and Engineering. These trends would include, amongst others, diversity and inclusion, the globalization of the economy and, also, the internationalization of finance. Moreover, students will advance their verbal and written English language skills by applying critical thinking tools in the creation of impact analyses specifically for technical business audiences of the global community.
<b>Teaching methods</b>	small and medium tasks and activities; open class inputs and discussion; individual task completion settings; peer review and discussion
<b>Learning outcome</b>	After passing this course successfully students are able to ... - record and employ vocabulary for business in technology - create a business technology impact analysis - articulate both orally and in written form the different ways in which technology impacts business - use specific vocabulary and terminology in, for example, leading a meeting
<b>Course contents</b>	- Business in Technology (for example finance and investment, the global economy, digital marketing and sales, international teams, and diversity and inclusion) - Impact Analyses for Business and Technology - Business English Talk
<b>Prerequisites</b>	B2 level English
<b>Assessment Methods</b>	- 30% Business Impact Analysis Group Task - 30% Business Impact Analysis Language Task - 40% in-class writing
<b>Recommended Reading and Material</b>	- Murphy, R. (2019). English Grammar in Use, 5th Edition. Klett Verlag.
<b>Attendance</b>	Obligatory
<b>Comments</b>	

## Materials and Technology for Performance Apparel

<b>Degree programme</b>	BHF
<b>Semester</b>	4
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	5.00

<b>Incoming places</b>	Limited
<b>Course description</b>	Materials are not only important in connection with appliances, but also for clothing. Due to their structure, functional materials have very specific properties, which are explained to the students in this course. They learn to recognize, test and analyze them.
<b>Teaching methods</b>	The theoretic fundamentals conveyed in impulse lectures of presence units are complemented via preparation, presentation and discussion of specific case studies by the students. The gained competencies are applied within a project work and are ultimately evaluated in a written exam.
<b>Learning outcome</b>	After passing this course successfully students are able to ... <ul style="list-style-type: none"> <li>- recognize different functional materials and to derive their production technology.</li> <li>- describe the connection between structure and functionality of high-tech materials in the sportswear sector.</li> <li>- analyze requirements for sports garments and to select appropriate materials and production technologies.</li> <li>- conceive ergonomic designs for specific target groups select appropriate test methods for the evaluation of material properties.</li> <li>- critically assess sustainability in the life cycle of high-tech materials.</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Materials science: Fibers &amp; Membranes</li> <li>- Manufacturing technologies</li> <li>- Material testing of fibers &amp; membranes</li> <li>- Physiology (thermoregulation)</li> </ul>
<b>Prerequisites</b>	<ul style="list-style-type: none"> <li>•Fundamentals of Physics for Engineering Sciences (PHY1)</li> <li>•Fundamentals of Anatomy and Physiology (APHYS)</li> <li>•Fundamentals of Biomechanics and Ergonomics (BIOME)</li> <li>•Materials Testing Plastics (WERKS)</li> <li>Industrial Design (INDUS)</li> <li>•Auswahl von Materialien und Herstellungsverfahren (MATER)</li> </ul>
<b>Assessment Methods</b>	- Details see Moodle Course
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Hayes, S. G., &amp; Venkatraman, P. (Eds.). (2018). Materials and technology for sportswear and performance apparel. CRC Press</li> <li>- Shishoo, R. (Ed.). (2015). Textiles for sportswear. Elsevier.</li> <li>- McLoughlin, J., &amp; Sabir, T. (Eds.). (2018). High-Performance Apparel: Materials, Development, and Applications. Woodhead Publishing.</li> </ul>
<b>Attendance</b>	According to FHTW regulations (Satzung § 5)

Comments	
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# International Business Engineering (BIW)

## Engineering Management

Degree programme	BIW
Semester	6
Course methods	ILV
Language	English
ECTS Credits	5.00
Incoming places	Limited

Course description	In the course of the module, knowledge and skills are imparted that are required in practice today by the professional profile of an "industrial engineer". In this module, the students will get to know the principles, procedures and methods for the design and development of mechatronic products. These are clearly explained using reference examples and worked out in the context of practical tasks.
Teaching methods	Integrative lecture, calculation and group exercises
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- to present the technical requirements of the job description of the industrial engineer in practice.</li> <li>- to evaluate and classify problems that predominate in practice.</li> <li>- Applying methodological knowledge in a problem-solving manner in practice.</li> <li>- Explain and apply procedural models for interdisciplinary system development (especially the 3-layer V-model).</li> <li>- Understand the complexity of the interaction between mechanical-electronic software and project management.</li> <li>- to break down, develop and manufacture a complex system into subsystems with the help of the acquired methodological competence.</li> </ul>
Course contents	<ul style="list-style-type: none"> <li>- Basic terms and historical development in industrial engineering</li> <li>- The job description of the industrial engineer</li> <li>- Industrial engineering in the product development process and product life cycle</li> <li>- System and method competence to develop an individual problem-</li> </ul>



	solving competence in IE - Requirements Specification - Difference and creation of functional model <-> active model - Systems engineering process models - Safety design, risk analysis - FMEA, FTA, test procedures - Model based system engineering, SysML - Development of a mechatronic system
<b>Prerequisites</b>	Production Technology, Management Basics 1 und 2
<b>Assessment Methods</b>	- Course-immanent performance assessment
<b>Recommended Reading and Material</b>	- Weilkiens T.: Systems Engineering with SysML/UML., 2006 - Douglas B.P.: Agile Systems Engineering., 2016 - Bokranz, R.; Landau K.: Handbuch Industrial Engineering: Produktivitätsmanagement mit MTM, Schäfer Pöschel, Auflage: 2, 2012 - Sihn, W.; Sunk, A.; Nemeth, T.; Kuhlmann, P.; Matyas, K.: Produktion und Qualität –Organisation, Management und Prozesse; Carl Hanser Verlag, 2016
<b>Attendance</b>	Attendance is mandatory according to university standards
<b>Comments</b>	none

## Business English

<b>Degree programme</b>	BIW
<b>Semester</b>	2
<b>Course methods</b>	UE
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	In this course, you will learn some of the key aspects of business communication in English, as well as the key processes and activities of starting a business. This includes figuring out what kind of organization your business should be, how best to market your product, and what considerations you should make about sustainability issues - an increasingly important topic. You will also discover important communication tools in business environments such as meetings, learn how to write clear and compelling reports,
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	and how to use innovative presentation methods to engage your audience.
<b>Teaching methods</b>	Small and medium scale assignments and activities; open-ended assignments and group discussion; individual assignments; peer review and discussion.
<b>Learning outcome</b>	After passing this course successfully students are able to ... <ul style="list-style-type: none"> <li>- Use business vocabulary in relation to various aspects of business communication</li> <li>- Use functional language in various business situations, such as meetings</li> <li>- Write a business report</li> <li>- Describe financial data</li> <li>- Understand and apply key marketing concepts and related language Business reports</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Business reports</li> <li>- Describe and present visual data</li> <li>- Communicating in a variety of business situations</li> <li>- Presentation in business English</li> </ul>
<b>Prerequisites</b>	English at level B2 of the Common European Framework of Reference for Languages
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Presentation: 50%</li> <li>- Self-study tasks: 20%</li> <li>- Written report task: 30%</li> </ul>
<b>Recommended Reading and Material</b>	- All required literature will be provided on the course page on Moodle
<b>Attendance</b>	andatory
<b>Comments</b>	None

## Applied Computer Science

<b>Degree programme</b>	BIW
<b>Semester</b>	4
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	5.00
<b>Incoming places</b>	Limited

<b>Course description</b>	<p>Software has become part of all areas of industrial engineering. Therefore, a basic education in applied computer science and the development of software are standard components of the graduates' toolbox. During the teaching, special emphasis is given to the abstraction of requirements and, subsequently, the realisation of corresponding software systems. In the first part of the course you will learn about the fundamentals of computer architecture, operating systems and virtualizations and you will work hands-on with file systems and bootable USB-Drives. In further classes and self-studies you will get insights into programming with python and the creation of algorithms using flowcharts in the first place and subsequently by using Python as a programming language. Python is a high-level programming language with use-cases in mechanic engineering, data aggregation, data analysis and many more. Working hands-on with datatypes and control structures will provide you the basic skills to create programs. Practical weekly moodle tests will keep you on track and will consequently challenge you to gain implementation expertise. Hands-on working with collections and files will expand your options in how to solve problems using your programming skills. In later classes you will expand your skills even further by working with an online simulation of a Raspberry Pi and by processing Open Data using APIs.</p>
<b>Teaching methods</b>	Combination of classes and self-study phases
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- understand and explain architectures, operating systems and peripherals of computers</li> <li>- analyze and explain problems/tasks, create algorithmic solutions (using flow charts) and implement them using structured programming techniques</li> <li>- understand and apply fundamental tasks of programming languages: reading, processing and output of structured data, basic operations in data structures, regular expressions, control structures (conditional queries, loops, functions).</li> <li>- execute software tests</li> <li>- develop practical applications on a Raspberry Pi simulation</li> <li>- develop practical applications based on open data</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Introduction Computer Science: Computer architecture, hardware, operating systems</li> <li>- Software and its characteristics</li> <li>- Programing paradigms, programing languages and their fields of application</li> </ul>

	<ul style="list-style-type: none"> <li>- Software development, development processes</li> <li>- Basics of computer architectures</li> <li>- Microcontroller vs. Microprocessor</li> <li>- Introduction to programming with python</li> <li>- Data processing: reading, processing, output of data</li> <li>- Control structures and loops</li> <li>- Collections</li> <li>- Functions</li> <li>- File-Handling</li> <li>- Regular Expressions</li> <li>- Application Bundeling</li> <li>- Raspberry Pi</li> <li>- M2M-communication</li> <li>- Open Data</li> </ul>
<b>Prerequisites</b>	none
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Weekly moodle tests</li> <li>- Practical exercises</li> <li>- Moodle exam at the end of the course</li> </ul>
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Christian Baun, Operating Systems / Betriebssysteme, DOI: 10.1007/978-3-658-29785-5</li> <li>- Connor P. Milliken, Python Projects for Beginners – A Ten-Week Bootcamp Approach to Python Programming, DOI: 10.1007/978-1-4842-5355-7</li> <li>- Sunil Kapil, Clean Python – Elegant Coding in Python, DOI: 10.1007/978-1-4842-4878-2</li> <li>- Python® Notes for Professionals, <a href="https://books.goalkicker.com/PythonBook/">https://books.goalkicker.com/PythonBook/</a> (free)</li> </ul>
<b>Attendance</b>	
<b>Comments</b>	75%

# Master DEGREE PROGRAMS

## Data Science (MDS)

### Business Development & Innovation

<b>Degree programme</b>	MDS
<b>Semester</b>	2
<b>Course methods</b>	ILV, FL
<b>Language</b>	English
<b>ECTS Credits</b>	5.00
<b>Incoming places</b>	Limited

<b>Course description</b>	This course introduces to Business Model Innovation.
<b>Teaching methods</b>	Self Study, Presentation, Case Studies, Group Workshop, Discussion, Presentations
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- describe and develop the elements of a data-driven business model</li> <li>- carry out a SWOT analysis of a business model</li> <li>- develop and apply a new business model based on trends and customer needs</li> <li>- create a business model using Business Model Canvas</li> <li>- develop creative solutions for challenging situations</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Elements of business models</li> <li>- Business Model patterns</li> <li>- Data-driven Business Models</li> <li>- Business Model Innovation</li> <li>- Design Thinking</li> <li>- Lean Startup</li> <li>- Business Modell Analysis</li> <li>- Business Modell Transformation</li> <li>- Business Model Canvas</li> </ul>
<b>Prerequisites</b>	Fundamentals of Management
<b>Assessment Methods</b>	- Project-based group work; presentations
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Gassmann et al, Geschäftsmodelle entwickeln (aktuelle Auflage)</li> <li>- Schallmo, Digitale Transformation von Geschäftsmodellen</li> <li>- Cavanillas, Curry, Wahlster, 2016. New Horizons for a Data-Driven</li> </ul>

	<p>Economy. A Roadmap for Usage and Exploitation of Big Data in Europe.</p> <ul style="list-style-type: none"> <li>- Glass, Callahan, 2014. The Big Data Driven Business: How to Use Big Data to Win Customers, Beat Competitors, and Boost Profits, Wiley</li> <li>- Franks, 2014. The Analytics Revolution: How to Improve Your Business By Making Analytics Operational In the Big Data Era, Wiley</li> </ul>
<b>Attendance</b>	Mandatory
<b>Comments</b>	

## Innovation and Technology Management (MTM)

### Agile Softwareentwicklung & Lean UX

<b>Degree programme</b>	MTM
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	4.00
<b>Incoming places</b>	Limited

<b>Course description</b>	<p>This course shows students the interplay between agile project management, user experience design and its efficient and effective integration, the so-called "Lean UX". The acquired knowledge is put into practice in the context of several exercises and a final project</p>
<b>Teaching methods</b>	<p>Self-study, lecture, discussion, group work, practical examples, online tutorials, project work.</p>
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- Apply methods of agile project management in practice (including effort estimation, user stories, software requirements specification)</li> <li>- build and coordinate project teams in an agile environment</li> <li>- explain the essential features of state-of-the-art user experience design and apply the most important methods in practice (e.g. expert reviews, UI prototyping, discount usability evaluation)</li> <li>- plan and implement projects considering the "Lean UX" aspect</li> </ul>

<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Agile project management (Scrum, Kanban etc.)</li> <li>- user experience</li> <li>- Software development</li> <li>- user stories</li> <li>- Effort estimation in software projects</li> <li>- Software Requirements Specification</li> <li>- Relevant standards</li> <li>- Subject- and expert-based methods</li> <li>- Personas</li> <li>- Prototyping</li> <li>- Eyetracking</li> <li>- Usability Lab</li> <li>- Minimum Viable Product</li> <li>- Discount Usability</li> <li>- UX Canvas</li> </ul>
<b>Prerequisites</b>	Basics of computer science as well as basics of project management
<b>Assessment Methods</b>	immanent performances (30%) + project work (70%)
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Gothelf, Lean UX: Applying Lean Principles to Improve User Experience, aktuelle Auflage</li> <li>- Richter/Flücker, Usability und UX kompakt: Produkte für Menschen, aktuelle Auflage</li> <li>- Roock/Wolf, Scrum verstehen und erfolgreich einsetzen, aktuelle Auflage</li> </ul>
<b>Attendance</b>	In principle, attendance is compulsory
<b>Comments</b>	Further information and teaching materials will be made available via the accompanying Moodle course.

## Changemanagement

<b>Degree programme</b>	MTM
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	4.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Within the framework of this module, students will acquire knowledge and basic competencies in the field of organizational change
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	management. Through sociological and psychological impulses, a thematic focus is placed on corporate purpose, sustainability, healthy work cultures and equity of opportunities. Experiential learning from a systemic, hyposystemic and solution-focused view is key.
<b>Teaching methods</b>	Presentation, self-study, exercises, exchange of experiences, discussion, case studies
<b>Learning outcome</b>	After passing this course successfully students are able to ... <ul style="list-style-type: none"> <li>- distinguish types of change</li> <li>- anticipate internal and external barriers to successful change</li> <li>- identify success factors for change</li> <li>- plan change management processes</li> <li>- define the most important steps and measures for a concrete change</li> <li>- understand reasons for resistance to change</li> <li>- Understand the company in and its interactions with the society</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Types of change</li> <li>- Phases of change</li> <li>- Barriers to change</li> <li>- Success factors for change</li> <li>- Reasons why change efforts fail</li> <li>- Change management</li> <li>- Corporate Purpose</li> </ul>
<b>Prerequisites</b>	Basics of business studies
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- conceptualization (20%)</li> <li>- peer-review (10%)</li> <li>- group work (40%)</li> <li>- individual reflection (20%)</li> <li>- presentation (10%)</li> </ul>
<b>Recommended Reading and Material</b>	- Stouten, J., Rousseau, D. M., de Cremer, D. (2018) Successful organizational change: Integrating the management Practice and scholarly articles . Academy of Management Annals, 12 (2), 752-788.
<b>Attendance</b>	The course will be held face to face in class. One session will take place in self-study mode. The final presentation will take place face to face.
<b>Comments</b>	Further details will be provided in the Moodle Course.

## Cost Management and Corporate Finance

<b>Degree programme</b>	MTM
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<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	4.00
<b>Incoming places</b>	Limited

<b>Course description</b>	During this course, students acquire further knowledge in the fields of financial analysis, cost management, financing and company valuation.
<b>Teaching methods</b>	lecture, exercises, discussion, e-learning, self-study, flipped classroom, business game
<b>Learning outcome</b>	After passing this course successfully students are able to ... <ul style="list-style-type: none"> <li>- to assess the advantage of an investment project by means of static or dynamic investment calculation</li> <li>- outline the typical contents of an investment guideline</li> <li>- Identify and implement cost reduction measures</li> <li>- Identify and implement measures to variabilize fixed costs</li> <li>- Calculate key figures to analyze the asset, profitability and liquidity situation</li> <li>- distinguish between different types of financing</li> <li>- determine the value of a company using the discounted cash flow method</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Accounting</li> <li>- Statement analysis</li> <li>- Cost management</li> <li>- capital budgeting</li> <li>- corporate financing</li> <li>- business valuation</li> </ul>
<b>Prerequisites</b>	Basics of business administration, accounting, cost accounting
<b>Assessment Methods</b>	- written final examination (50%) + points for immanent performance business game (50%)
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Berk, Jonathan, and Peter DeMarzo. Corporate Finance. Actual Edition. Harlow: Pearson Education Limited</li> <li>- Brealey, Richard A., Stewart C. Myers, und Franklin Allen. Principles of Corporate Finance. New York: McGraw-Hill Higher Education</li> <li>- Charles T. Horngren; Srikant M. Datar; Madhav V. Rajan, Cost Accounting, Global Edition, Pearson Education Limited</li> </ul>

	<ul style="list-style-type: none"> <li>- Eisl/Hofer/Losbichler, Grundlagen der finanziellen Unternehmensführung. Band IV: Controlling</li> <li>- Losbichler, Grundlagen der finanziellen Unternehmensführung. Band III: Cashflow, Investition und Finanzierung</li> </ul>
<b>Attendance</b>	Block 1 is generally not subject to compulsory attendance, Block 2 is subject to compulsory attendance
<b>Comments</b>	Further information on the course and the teaching materials used will be provided in the accompanying Moodle course.

## IT-Security (MCS)

### Advanced English Communication

<b>Degree programme</b>	MCS
<b>Semester</b>	2
<b>Course methods</b>	SE
<b>Language</b>	English
<b>ECTS Credits</b>	1.50
<b>Incoming places</b>	Limited

<b>Course description</b>	The theory and examples of different innovative management concepts will be analyzed for the possible implementation in the students' own business environment. Moreover, the course will examine the unique organizational cultures and management concepts that enable innovation. In addition advanced techniques of presentation and academic paper construction will be taught to enable students to effectively and formally express their ideas on this subject matter.
<b>Teaching methods</b>	Active participation and discussion .Fulfilment of writing assignments and presentation
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- understand the importance of culture to a firm.</li> <li>- explain the characteristics of an innovative culture.</li> <li>- develop concepts for how an organisation can become more innovative.</li> <li>- use of subject specific English vocabulary</li> <li>- write a argumentative, coherent and academically written seminar paper on the subject of corporate culture and innovation</li> </ul>

<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Innovative corporate cultures</li> <li>- New themes in innovation and how they can be applied to businesses</li> <li>- Critical thinking in seminar discussions</li> <li>- Advanced presentation techniques</li> <li>- Schumpeter's concept of creative destruction / Schien's theory of leadership / Cameron and Quinn's model for diagnosing organisational culture</li> <li>- Case studies: Innovative businesses, e.g. Google, Apple, Toyota</li> <li>- Overview and application of key concepts in writing an academic paper</li> </ul>
<b>Prerequisites</b>	Common European Framework of Reference for Languages Level B2
<b>Assessment Methods</b>	- Group Presentation; Group Seminar Paper; Participation
<b>Recommended Reading and Material</b>	- Lecturer Handouts
<b>Attendance</b>	Compulsory
<b>Comments</b>	

## Scientific Writing

<b>Degree programme</b>	MCS
<b>Semester</b>	4
<b>Course methods</b>	SE
<b>Language</b>	English
<b>ECTS Credits</b>	1.50
<b>Incoming places</b>	Limited

<b>Course description</b>	The focus of the course is an overview of academic language and formal criteria required for writing and presenting a conference paper, and writing an abstract.
<b>Teaching methods</b>	Teaching methods will be used to give the students opportunities to improve and refine their written language skills. Mini- lectures will be used for input on writing techniques and use of language. However, students will also be given in-class activities to actively engage in using the language in order to enhance language awareness and sensitivity. These activities may include pair activities, group

	activities, etc. Students will be encouraged to approach written language analytically and critically, for example by giving constructive feedback after in-class writing activities, comparing and analyzing texts, etc. Students will be encouraged to use appropriate language when presenting.
<b>Learning outcome</b>	After passing this course successfully students are able to ... - structure a conference paper according to the formal criteria given - write a conference paper according to the language related criteria given - write an abstract according to the formal criteria given - write an abstract according to the language related criteria given - present a conference paper
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- The role, content, structure, and style of a conference paper</li> <li>- The role, content, style and types of scientific abstracts</li> <li>- Language-related criteria of a conference paper and an abstract</li> <li>- Writing a conference paper and abstract</li> <li>- Presenting a conference paper</li> </ul>
<b>Prerequisites</b>	Completion of previous semester courses
<b>Assessment Methods</b>	- Active participation in class activities and timely completion of assignments
<b>Recommended Reading and Material</b>	- Göschka, M. et al (2014) Guidelines for Scientific Writing, Skriptum Additional current handouts
<b>Attendance</b>	Attendance is compulsory at all lessons for this course.
<b>Comments</b>	

## Industrial Engineering & Business (MIB)

### Int. Marketing and Product Management

<b>Degree programme</b>	MIB
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Internationalization, globalization and culturalization are currently
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	<p>known as key success factors of market and brand leadership. According to the current meaning students shall gain an overview of decision fields and peculiarities of international marketing in theory comparison and in the dispute with practice-oriented decision-making situations based on case studies. In particular, students should learn to understand the strategic challenges of market-oriented internationalization strategies and shall name the resulting consequences and requirements on the analysis, Market Selection- and positioning decision and apply. Using practical examples, the students will be sensitized between mainstream marketing and International Marketing with respect to the differences in the marketing mix and should – from the perspective of an acting marketing head - acquire knowledge to build, implement and guide a comprehensive internationalization process from the perspective of marketing communication.</p>
<b>Teaching methods</b>	
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- explain the main spheres of activity of nternationalization by Kotler and implement their consequence on the basis of practical cases decisions (Case Studies).</li> <li>- apply cultural influences on the models of Hofstede, Hall and Thomas as an evaluation basis for environmental analysis and market selection to analyze their influence on the assessment of market attractiveness and to develop appropriate market selection programs.</li> <li>- assess different brands from the FMCG, IGM and DLM regarding their internationalization and positioning strategies and identify the differences in the respective marketing mix.</li> <li>- implement the essential decisions of internationalization based on a Case Study in objective, market selection and program design (marketing mix development) and to justify their choices from the perspective of marketing managers.</li> <li>- identify the essential model and approach differences in the product, price, distribution and communication policy between mainstream marketing and international marketing, to interpret their impact on the company's success and its market position and to develop plans for an independent marketing mix based on given project tasks in the context of an internationalization strategy at the level of the market leaders.</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Introduction to the global product and brand management</li> <li>- Global product strategies and their origins</li> </ul>

	<ul style="list-style-type: none"> <li>- Management of global brands during the product life cycle</li> <li>- Standardization versus adaption</li> <li>- Analysis of various branding strategies based on familiar examples</li> </ul>
<b>Prerequisites</b>	- Basic Knowledge of Mainstream Marketing and Business Administration- English speaking and writing   Level C1
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- written exam (75%)</li> <li>- exams via Moodle (each 5%, total 25%)</li> </ul>
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Hollensen (2012): Essentials of Global Marketing, Pearson</li> <li>- Müller/Gelbrich (2004): Interkulturelles Marketing, Vahlens</li> <li>- Usunier/Lee (2012): Marketing Across cultures, Pearson</li> </ul>
<b>Attendance</b>	Attendance is compulsory
<b>Comments</b>	

## Medical Engineering & eHealth (MME)

### Bioinformatics

<b>Degree programme</b>	MME
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	4.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Computer Science provides for modern and essential methods for analyzing and researching biological systems. The course presents computer aided methods in context of biomedical examples.
<b>Teaching methods</b>	Seminar / Workshop, problem based learning
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- describe biological systems</li> <li>- select computer aided methods for successfully investigating biomedical systems and data</li> <li>- apply selected computer-aided methods for analysing biomedical systems and data</li> </ul>
<b>Course contents</b>	- Introduction Bioinformatics, Computational Biology and Systems Theory, DNA Sequencing, modelling epidemics

	<ul style="list-style-type: none"> <li>- Technologies for analysing biological data and systems (z.B. Python, BLAST, SIR, K-means, Clustering, numerical for differential equations, cellular automata)</li> <li>- practical tasks (adapted to students background)</li> </ul>
<b>Prerequisites</b>	Basic computer science background Basic programming skills Basic biomedical background
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Assignments</li> <li>- Presentation</li> </ul>
<b>Recommended Reading and Material</b>	- Provided per topic in course
<b>Attendance</b>	
<b>Comments</b>	

## Artificial Intelligence

<b>Degree programme</b>	MME
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	4.00
<b>Incoming places</b>	Limited

<b>Course description</b>	This Lecture builds up knowledge about the algorithms and the basics of artificial intelligence (AI) and soft computing
<b>Teaching methods</b>	Theory, Examples, Exercises
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- describe agents and environments</li> <li>- describe the concept of rational behavior</li> <li>- distinguish between different problem environments</li> <li>- distinguish between agent structures</li> <li>- name problem-solving agents</li> <li>- design a kind of goal-based agent</li> <li>- distinguish between problem types</li> <li>- do a graph search with partial information</li> <li>- find a defined problem formulation</li> <li>- name the basic search algorithms including: e.g. uninformed search strategies</li> </ul>

	<ul style="list-style-type: none"> <li>- enabling a constraint satisfactory search</li> <li>- using informed search strategies</li> <li>- define the first heuristic functions for the informed search</li> <li>- know, how to apply simulated annealing techniques</li> <li>- know how to apply evolutionary algorithms</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Basic algorithms of artificial Intelligence</li> <li>- Agents</li> <li>- Problem Solving strategie</li> <li>- Informed Search</li> <li>- Constrain Satisfactory Problems</li> <li>- AI and Games</li> </ul>
<b>Prerequisites</b>	C/C++
<b>Assessment Methods</b>	- Exercises (20%) and project (80%)
<b>Recommended Reading and Material</b>	- Artificial Intelligence: A Modern Approach (Prentice Hall Series in Artificial Intelligence) Stuart Russell, Peter Norvig
<b>Attendance</b>	Attendance not required but recommended!The student needs to be present for the project meetings and final presentation.
<b>Comments</b>	

## Electromagnetic Compatibility

<b>Degree programme</b>	MME
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	4.00
<b>Incoming places</b>	Limited

<b>Course description</b>	The course is subdivided in two parts:- Part 1 covers physical fundamentals of Electromagnetic Compatibility (EMC) related to electrical appliances including regulatory basics for product conformity- Part 2 focuses on effects of electromagnetic fields (EMF) on the human body, including regulatory basics for limiting personal exposure against EMFs, as well as electromagnetic influences on implants
<b>Teaching methods</b>	Lessons and practical homework (1 assignment, chosen from several proposals)The course will be held in 10 units (6:35 - 9:00



	<p>p.m. each)One of these units will be held as an excursion to the EMC labs in Seibersdorf (approx. 35 km southeast of Vienna)For a detailed schedule of the units, please see semester planDetails about the excursion will be negotiated in the course between lecturer and students</p>
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- identify potential problems of electromagnetic compatibility during product development</li> <li>- apply the fundamental EMC design rules in practice</li> <li>- name the most important directives, standards and guidelines relevant for EMC conformity assessment of medical equipment and use them to assess the properties of a device in view of the underlying legal requirements</li> <li>- estimate the relevance of exposure situations in practice</li> <li>- name the technical possibilities of exposure assessment, their advantages and drawbacks and their limitations</li> <li>- identify potentially hazardous situations regarding electromagnetic interference with electronic implants in practice</li> <li>- name the most important directives, standards and guidelines relevant for limiting personal exposure against electromagnetic fields</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Part 1 (Lamedschwandner):</li> <li>- Introduction to Electromagnetic Compatibility (EMC)</li> <li>- EMC conformity assessment</li> <li>- European Union directives and CE marking of products</li> <li>- The EMC directive</li> <li>- EMC standards</li> <li>- EMC test methods</li> <li>- Functional safety and EMC</li> <li>- Development of electrical appliances with respect to EMC</li> <li>- Design basics</li> <li>- Printed circuit board design</li> <li>- Cabling, grounding and shielded cables</li> <li>- EMC filters, ferrites and box shielding</li> <li>- Economic EMC design principle</li> <li>- Part 2 (Schmid):</li> <li>- Biophysical basics</li> <li>- Effects of electromagnetic fields on the human body</li> <li>- Excitation of cells by induced currents (low frequency fields)</li> <li>- Tissue heating by power absorption (radio frequency and microwave fields)</li> <li>- Other reported, but not yet established effects</li> </ul>

	<ul style="list-style-type: none"> <li>- Safety limits and regulatory basics</li> <li>- Exposure assessment methods</li> <li>- Electromagnetic interference with implants</li> <li>- Malfunction of electronic implants</li> <li>- Concentration of currents by metallic implants</li> <li>- Movement of ferromagnetic implants in strong magnetic fields</li> </ul>
<b>Prerequisites</b>	Fundamentals of electrical engineering
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Solution and Presentation of homework (50%)</li> <li>- Written exam (50%)</li> </ul>
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Lamedschwandner K. EMC for MBE – Part 1, Chapter 1-3. Presentation Slides. Available in download section of the course</li> <li>- Paul CR. 2006. Introduction to Electromagnetic Compatibility, 2nd Edition, Wiley, New York, ISBN: 978-0-471-75500-5</li> <li>- Schmid G. EMC for MBE. Part 2, EMF Safety. Presentation Slides. Available in download section of the course</li> </ul>
<b>Attendance</b>	Attendance is compulsory
<b>Comments</b>	

## Ethics

<b>Degree programme</b>	MME
<b>Semester</b>	2
<b>Course methods</b>	VO
<b>Language</b>	English
<b>ECTS Credits</b>	1.00
<b>Incoming places</b>	Limited

<b>Course description</b>	The course imparts basic knowledge of ethics in medicine to the students. The focus is on raising the awareness of the relevance of ethical questions in engineering and medicine and their ethical impacts on society and the training of ethical decision-making and argumentation.
<b>Teaching methods</b>	Seminar: Theory Inputs Case Studies Group work Ethical arguing Discussions
<b>Learning outcome</b>	After passing this course successfully students are able to ... <ul style="list-style-type: none"> <li>- outline selected basic terms and principles of medical ethics (for example moral status, allocation ethics, concepts of health and</li> </ul>

	<p>disease/disabilities) by the means of simple examples.</p> <ul style="list-style-type: none"> <li>- apply ethical standards to latest research developments in selected actual case studies in medicine and engineering.</li> <li>- describe the steps of ethical decision-making and argumentation and to apply them in selected case studies for ethical assessment of conflicting issues in the field of research and medicine.</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Fundamental positions of ethical decision-making and argumentation</li> <li>- Experiments with human subjects and animals</li> <li>- Ethics issues of resource allocation</li> <li>- Ethical concepts to health-disease/illness-disabilities</li> <li>- Intercultural ethical aspects of medicine and engineering</li> <li>- Medical information systems (eHealth, data security, privacy, confidentiality)</li> </ul>
<b>Prerequisites</b>	
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Course with an immanent character (grade):</li> <li>- Introduction into a chosen topic by the student</li> <li>- Hand out</li> <li>- The student is leading a discourse about the chosen in the group</li> </ul>
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Literature at the beginning of the course</li> </ul>
<b>Attendance</b>	Attendance is compulsory
<b>Comments</b>	

## Study Design and Biostatistics

<b>Degree programme</b>	MME
<b>Semester</b>	2
<b>Course methods</b>	SE
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	<p>A collection of mathematical methods in the field of non-parametric statistics are presented. These can be used for planning experiments. Obtaining , organizing, summarizing presenting and analysing this data will be followed up by interpreting it and drawing</p>
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	conclusions based on this data sets.
<b>Teaching methods</b>	Lecture & Examples
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- justify a research question in the field of non-parametric statistics after identifying the current state of the art with regard to scientific considerations, formulate the question comprehensibly and to define verifiable target criteria</li> <li>- plan the phases of a scientific study, conduct it precisely, document it comprehensibly, and to ensure the comprehensibility, dependability, plausibility and transferability to other problems areas and contexts</li> <li>- relate research questions and results to a medical environment</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Testing methods for frequencies</li> <li>- Testing methods for rank-data</li> <li>- Testing methods for cardinal data</li> <li>- Relationship metrics and their tests</li> <li>- Agreement metric</li> </ul>
<b>Prerequisites</b>	Parametric Statistics. The only mathematical prerequisite needed for the material found in the outline is arithmetic and some basic algebra. Excel, MatLab/Octave, R
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- written exam 50%</li> <li>- moolde examples 50%</li> </ul>
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Elementary Statistics, Mario F. Triola Publication Date: January 6, 2011   ISBN-10: 0321694503   ISBN-13: 978-0321694508   Edition: 11</li> <li>- Nonparametric Statistics for Health Care Research Statistics for Small Samples and Unusual Distributions Second Edition ISBN 978 - 1 - 4522 - 8196 - 4 (pbk.: alk. paper) Medicine ? Statistical methods. Nonparametric statistics.</li> </ul>
<b>Attendance</b>	optional
<b>Comments</b>	N/A

## Scientific Publishing

<b>Degree programme</b>	MME
<b>Semester</b>	2
<b>Course methods</b>	SE
<b>Language</b>	English

<b>ECTS Credits</b>	1.50
<b>Incoming places</b>	Limited

<b>Course description</b>	A basic understanding of “scientific life” is given, covering writing rules, strategies for scientific papers publishing, "how to find RELEVANT literature", and how to survive a scientific conference.
<b>Teaching methods</b>	Upfront teaching, group work, students presentation
<b>Learning outcome</b>	After passing this course successfully students are able to ... <ul style="list-style-type: none"> <li>- Explain the structure of a scientific paper</li> <li>- Write a scientific abstract according to scientific journals rules</li> <li>- Can explain the process from having a first idea to getting a paper accepted</li> <li>- Can prepare a scientific presentation (oral, poster) for a scientific conference</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- What to do before a (scientific) paper is written</li> <li>- Structures of scientific papers</li> <li>- Basics of scientific writing</li> <li>- Literature search, Inside PubMed</li> <li>- Critical Comments about today's publication behavior</li> <li>- What else is needed to get a publication accepted</li> <li>- The review</li> <li>- The Scientific Conference</li> <li>- Paper / Poster Presentation</li> </ul>
<b>Prerequisites</b>	Basic writing skills
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Quality of a self written abstract</li> <li>- Evaluation of other abstracts</li> <li>- Quality of "scientific conference like" presentation</li> <li>- Evaluation of presentations</li> <li>- Written exam</li> </ul>
<b>Recommended Reading and Material</b>	- <a href="http://www.icmje.org">http://www.icmje.org</a>
<b>Attendance</b>	
<b>Comments</b>	

## Advanced Optics

<b>Degree programme</b>	MME
<b>Semester</b>	2

<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	4.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Geometric Optics, Microscopy Techniques & Spectroscopy (including medical applications)
<b>Teaching methods</b>	Frontal lecture Advanced Optics Laboratory exercises (spectroscopy + microscope, mechanical eye model)
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- explain Maxwell's equations and simple conclusions from them</li> <li>- define basic properties of light and the behavior at interfaces (refraction, (total) reflection, polarization, Fresnel formulas, Brewster law)</li> <li>- represent applications of optical components (lenses, mirrors, prisms, optical fibers, diffraction gratings, classical light sources, LED, laser, polarizers) simple optical systems (light microscope)</li> <li>- represent applications of optical components (lenses, mirrors, prisms, optical fibers, diffraction gratings, classical light sources, LED, laser, polarizers) and of simple optical systems (light microscope)</li> <li>- define spherical aberrations, coma, astigmatism, chromatic aberration, distortions, explain Abbe's diffraction limit, classifying Zernike polynomials with respect to the context</li> <li>- illustrate discussed microscopic techniques and their advantages, represent the functioning of the human eye based on the eye model</li> <li>- present basics of spectroscopy and explain medical application of scattering (Raman, Brillouin)</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Motivational introduction to modern optical topics (computer-generated holograms, laser physics, metamaterials)</li> <li>- Meaning of the Maxwell's equations + simple conclusions from them, behavior of light rays in propagation + at interfaces (refraction, (total) reflection, Brewstergesetz, Fresnel formulas)</li> <li>- Overview of optical components (lenses, mirrors, prisms, optical fibers, diffraction gratings, classical light sources, LED, lasers, polarizers), thin &amp; thick lenses, mirrors (image construction, matrix method)</li> <li>- Aberrations (characterization, minimization, spherical aberration, coma, astigmatism, distortion, chromatic aberration, Abbe diffraction</li> </ul>

	limit, Zernike polynomials) - Microscopy techniques + mechanical eye Model - Spectroscopy in general with focus on: Raman and Brillouin scattering
<b>Prerequisites</b>	Basics of Analysis and Algebra, Basics of Physics
<b>Assessment Methods</b>	- Written exam - 1 Laboratory protocol
<b>Recommended Reading and Material</b>	- Bergmann & Schäfer. "Lehrbuch der Experimentalphysik". Band 3. Optik. 2004. - Bergmann & Schäfer. "Lehrbuch der Experimentalphysik". Band 3. Optik. 2004. - Born & Wolf. "Principles of Optics". 1999
<b>Attendance</b>	Frontal lectures: 80% Laboratory exercises: 100%
<b>Comments</b>	

## Project Management and Leadership Skills

<b>Degree programme</b>	MME
<b>Semester</b>	2
<b>Course methods</b>	SE
<b>Language</b>	English
<b>ECTS Credits</b>	1.00
<b>Incoming places</b>	Limited

<b>Course description</b>	This course provides an overview of both the latest practical and the current theoretical leadership theories. One of the course's fundamental components will be the reflection of own behaviour regarding particular issues concerning leadership in project management.
<b>Teaching methods</b>	Theory input Teamwork Role play
<b>Learning outcome</b>	After passing this course successfully students are able to ... - identify and to explain tasks and instruments of leadership (for example delegation, agreement on objectives). - explain classical management models (for example leading continuum, Maturity Model) and to apply to practical examples. - describe different assumptions about human nature (for example McGregor) and to derive the consequences for the leading of co-

	workers.
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Leadership styles and instruments (for example staff appraisal)</li> <li>- Motivation, promotion and development of employees</li> <li>- Leadership functions versus professional tasks</li> <li>- Consequence of “not leading”</li> <li>- Role of the leader in a change process</li> <li>- Dealing with crises, success and failures</li> </ul>
<b>Prerequisites</b>	Team Management Skills
<b>Assessment Methods</b>	- An individual reflection paper about the leadership issues encountered in the semester and how the knowledge about leadership was applied.
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Daft, R. (2008): New Era of Management, Mason/Ohio:Thomson</li> <li>- Pettinger, R. (2007): Introduction to Management, Houndmills/Hampshire: Palgrave Macmillan</li> <li>- Schermerhorn, J. (2008): Management, Hoboken/New Jersey: John Wiley</li> </ul>
<b>Attendance</b>	Attendance is compulsory
<b>Comments</b>	This course may reflect team experiences from elsewhere, e.g from the Project Related Teamwork course.

## eHealth Applications

<b>Degree programme</b>	MME
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	4.00
<b>Incoming places</b>	Limited

<b>Course description</b>	<p>We want to understand what "eHealth" actually is, which applications exist, what needs to be done to implement it, on the legal side, in IT systems, in the medical system and economically. How can we evaluate eHealth applications e.g. costs - benefit? We will look at eHealth with the eyes of politicians, patients, economists, industry, medical experts. The course uses a “Problem Based Learning” (PBL) approach. Students will experience the views of different stakeholders in an additional business role playing game.</p>
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<b>Teaching methods</b>	The course uses problem based learning, triggered by brief presentations from the lecturer. As a result this students will develop evidence based recommendations to stakeholders. A role playing game will enable us to understand how the stakeholders act, and provoke feedback to the recommendations.
<b>Learning outcome</b>	After passing this course successfully students are able to ... - explain requirements and recent examples of applications of eHealth - critically consider literature and other sources of information for evaluating eHealth applications - consider the views of different stakeholders in designing eHealth applications
<b>Course contents</b>	- requirements and recent examples of applications of eHealth - basic introduction into the socioeconomic environment of eHealth (reimbursement, sustaining resources, legal issues) - engineering concepts for eHealth
<b>Prerequisites</b>	Basic knowledge of software development, familiarity with the medical field
<b>Assessment Methods</b>	- Seminar paper: Evidence based recommendation to stakeholders
<b>Recommended Reading and Material</b>	- eHealth Action Plan 2012-2020 ( <a href="http://ec.europa.eu/health/ehealth/docs/com_2012_736_en.pdf">http://ec.europa.eu/health/ehealth/docs/com_2012_736_en.pdf</a> )
<b>Attendance</b>	The course uses PBL therefore attendance is mandatory.
<b>Comments</b>	Attendance to relevant events (congresses, workshops: eHealth Summit, HL7 Jahrestagung, IHE Day, ...) can be accredited for the course, contact the lecturers.

## Quality and Regulatory Affairs Management

<b>Degree programme</b>	MME
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	4.00
<b>Incoming places</b>	Limited

<b>Course description</b>	The course introduces the main processes and steps of implementing quality management systems for design and
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	development and putting to market of medical devices. It provides the necessary steps for addressing regulatory issues in an application oriented perspective.
<b>Teaching methods</b>	Lectures will introduce the topics. Students will extend their knowledge and skills in small assignments.
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- describe and handle processes to address regulatory issues of medical devices, regarding especially the "Medical Device Directive"</li> <li>- use quality management systems to address regulatory issues in a structured way</li> <li>- describe and perform measures of risk management, generally and in the sense of a "Medical IT-Network Risk Manager" (IEC 80001-1).</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Medical Device Directive and Harmonised Standards (ISO 13485, ISO 14971, EN 60601-x, IEC 80001-1, ...). Case examples and experiences from the steps of medical device development, from the initial concept to market. Classification, methods for evaluation of conformity). Risk analysis, risk analysis case file. software as medical device, CE mark, accredited and notified bodies. Basic introduction to further regulations (EMC, biocompatibility, RoHS...). Basic of clinical trials. EU- vigilance system. IVD`s, AIMDD. International requirements (FDA, CMDCAS, GxP, UL, ...).</li> <li>- Case studies and experiences from medical device development from the idea to marketability. Classification, methods for conformity testing. Risk analysis, software as medical device, CE marking, accredited and notified bodies.</li> <li>- Further fields of expertise (EMC, Biocompatibility, RoHS...). Clinical evaluation. EU vigilance system. IVDs, AIMDD. International requirements (FDA, CMDCAS, GxP, UL, ...).</li> </ul>
<b>Prerequisites</b>	- Basic concepts of device or software development. - Basic concepts of quality.
<b>Assessment Methods</b>	- Final exam and smaller assignments
<b>Recommended Reading and Material</b>	- See learning platform
<b>Attendance</b>	The course includes discussions and assignments, so attendance is necessary to participate in assignments and discussions. In case students miss lectures they must contact the lecturers and agree on measures to handle the situation.
<b>Comments</b>	

## Writing the Master's Thesis

<b>Degree programme</b>	MME
<b>Semester</b>	4
<b>Course methods</b>	SO
<b>Language</b>	English
<b>ECTS Credits</b>	28.00
<b>Incoming places</b>	Limited

## Information Systems Management (MWI)

### System Integration

<b>Degree programme</b>	MWI
<b>Semester</b>	2
<b>Course methods</b>	ILV, FL
<b>Language</b>	English
<b>ECTS Credits</b>	5.00
<b>Incoming places</b>	Limited

<b>Course description</b>	All the different applications of a company's IT environment need to communicate with other systems. The course Systems Integration focuses on the fundamentals and most important concepts to improve communication between IT systems on each level to help you to plan and develop value-adding integration solutions. The objective is to get to know the most important concepts for Enterprise Application Integration (EAI). Microsoft BizTalk Server serves as an example of how Microsoft implemented these patterns and principles. Practical exercises will give the possibility to gain some experience in developing system integration solutions.
<b>Teaching methods</b>	SATs, practical exercises, preparation and presentation of a related topic as part of the group project
<b>Learning outcome</b>	After passing this course successfully students are able to ... - reproduce the context, advantages and disadvantages of basic messaging principles and common data formats (flat files and XML) in terms of connecting IT systems. - reproduce and explain the most important enterprise application

	<p>integration patterns.</p> <ul style="list-style-type: none"> <li>- explain the purpose of transactions and their use as atomic or long-running transactions within enterprise application integration solutions.</li> <li>- reproduce and evaluate the advantages and disadvantages of enterprise application integration patterns to develop a suitable integration software design.</li> <li>- analyse and to make use of the different roles and environments needed as part of the software development process.</li> <li>- apply the basic principles of web services to implement a service solution.</li> <li>- develop an enterprise application integration solution by using Microsoft BizTalk Server as messaging middleware.</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Message based communication</li> <li>- Web services</li> <li>- Enterprise application integration</li> <li>- Reliability and environments</li> <li>- Message broker</li> <li>- Content-based routing</li> <li>- Business process modeling</li> <li>- Transactions</li> </ul>
<b>Prerequisites</b>	
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- SATs - 10%</li> <li>- Practical exercises - 30%</li> <li>- Group project - 30%</li> <li>- Final Exam - 30%</li> </ul>
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Course book</li> <li>- VMware image including a complete Microsoft BizTalk Installation</li> </ul>
<b>Attendance</b>	
<b>Comments</b>	

## AI Engineering (MAI)

### Scientific Papers in AI

<b>Degree programme</b>	MAI
<b>Semester</b>	2
<b>Course methods</b>	ILV

<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	This course prepares the students for writing their AI master thesis and the AI master paper. After a short repetition of the scientific work principles, a large part of the course focuses on journal clubs about AI papers. The latest publications as well as classic important AI papers are read and presented by the students. This is followed by a critical discussion and group evaluation.
<b>Teaching methods</b>	combination of lectures and own presentations
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- identify different types of scientific work</li> <li>- use different types of English literature</li> <li>- reason about subject-relevant research question based on the state-of-the-art collected from scientific points of view and to formulate it in a comprehensible manner, and to define verifiable criteria for achieving goals</li> <li>- independently plan the phases of a scientific development or investigation using conventional methods, carry them out in a targeted manner, document them in a comprehensible manner, and thereby systematically ensure the traceability, reliability, plausibility and transferability of the findings to comparable problem situations or contexts</li> <li>- to select and apply suitable methods for the respective question, and accordingly to write the structure of a master's thesis, a proposal and then the master's thesis</li> <li>- present own scientific work as well as scientific work of other people</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- scientific working, writing and methods</li> <li>- finding relevant AI publications</li> <li>- understanding and presenting AI publications</li> </ul>
<b>Prerequisites</b>	successfully completed bachelor thesis
<b>Assessment Methods</b>	- contributions during lectures and own presentations
<b>Recommended Reading and Material</b>	- Kornmeier, (2016). Wissenschaftlich schreiben leicht gemacht: Für Bachelor, Master und Dissertation, utb.
<b>Attendance</b>	
<b>Comments</b>	

# Software Engineering (MSE)

## Mobile Application Engineering

<b>Degree programme</b>	MSE
<b>Semester</b>	4
<b>Course methods</b>	ILV, FL
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Introduction into app development for Android and iOS.
<b>Teaching methods</b>	
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- After successfully completing the course, students are able to</li> <li>- develop Android and iOS Apps, using the latest Development Environment and Toolchain</li> <li>- describe the Lifecycle of Smartphone Applications and explain common concepts in the areas of Testing, Publishing, Marketing &amp; Business Models</li> <li>- estimate the required resources for a feature implementation on Android and iOS</li> </ul>
<b>Course contents</b>	- Android and iOS app development and source control management with Git.
<b>Prerequisites</b>	Basic software development experience with Java / C/C++ / Objective C.
<b>Assessment Methods</b>	- Participation, development of the project, delivery dates, clean source code with comments and Git commits.
<b>Recommended Reading and Material</b>	- Joseph Anuzzi Jr, Lauren Dracay, Shane Conder (2014): Advanced Android Application Development, Addison-Wesley Professional Neil Smyth (2015): iOS 8 App Development Essentials - Second Edition: Learn to Develop iOS 8 Apps using Xcode and Swift 1.2, CreateSpace Independent Publishing Platform
<b>Attendance</b>	required
<b>Comments</b>	

## Selected Topics Software Management

<b>Degree programme</b>	MSE
<b>Semester</b>	4
<b>Course methods</b>	ILV, FL
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Graduates of this course receive indepth knowledge about the interfaces between management and IT. The viewpoints of companies, as startups and corporates and their managers and CIOs are being approached with a focus on the business aspect. Business objectives and IT (3 ECTS) Elected chapters of software management (3 ECTS) • International technology exploitation
<b>Teaching methods</b>	Lecture with student participation Best Practice Use Cases Case studies
<b>Learning outcome</b>	After passing this course successfully students are able to ... <ul style="list-style-type: none"> <li>- Draw Project portfolio-Management and corporate strategies</li> <li>- Define international technology exploitation</li> <li>- Overview about tools and approaches</li> <li>- Identify international technology exploitation networks</li> <li>- Agile project management</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Project management</li> <li>- Project portfolio management</li> <li>- Agile project management</li> <li>- Technology exploitation</li> </ul>
<b>Prerequisites</b>	Basics Project Management
<b>Assessment Methods</b>	- Course immanent assessment method and group assignment
<b>Recommended Reading and Material</b>	- Agile Prozesse: Von XP über Scrum bis MAP, Eckhart Hanser
<b>Attendance</b>	requiered
<b>Comments</b>	Hands-on course: Experts from corporates/startups are being invited/visited

## User Experience Evaluation

<b>Degree programme</b>	MSE
<b>Semester</b>	4
<b>Course methods</b>	ILV, FL
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	This course teaches evaluation methods and challenges regarding usability and user experience measurement. Subjective experiences can be quantified and objectively measured using metrics and statistical methods.
<b>Teaching methods</b>	Practical exercises and examples, discussions, group work, lectures
<b>Learning outcome</b>	After passing this course successfully students are able to ... - apply statistical methods correctly to compare various metrics (time on task, task success) - apply these methods in a project environment - name various UX metrics as well as their categories, collect metrics, analyse and interpret them - analyse results (e.g. significance) and present them appropriately
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- UX metrics</li> <li>- suitable statistical methods</li> <li>- data visualization</li> <li>- reproducibility of tests</li> </ul>
<b>Prerequisites</b>	Basics of user centered designs and software usability
<b>Assessment Methods</b>	- Course immanent assessment method and/ or end exam
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Tullis, Thomas / Albert, William. (2008) Measuring the User Experience : Collecting, Analyzing, and Presenting Usability Metrics, Morgan Kaufmann, ISBN-13: 978-0123735584</li> <li>- Sauro, Jeff. (2012) Quantifying the User Experience : Practical Statistics for User Research, Morgan Kaufmann, ISBN-13: 978-0123849687</li> <li>- Bortz, Jürgen / Lienert, Gustav A. (2003) Kurzgefasste Statistik für die klinische Forschung : Leitfaden für die verteilungsfreie Analyse kleiner Stichproben, Springer, ISBN-13: 978-3540757375</li> </ul>
<b>Attendance</b>	
<b>Comments</b>	



## Mental Power for IT Disciplines

<b>Degree programme</b>	MSE
<b>Semester</b>	4
<b>Course methods</b>	ILV, FL
<b>Language</b>	German
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	In this course you will learn to use the whole capacity of your brain to solve problems and to achieve any goal you wish.
<b>Teaching methods</b>	- Seminar- Distant Learning
<b>Learning outcome</b>	After passing this course successfully students are able to... - formulate goals you want to achieve which are suitable for your subconscious mind - practicing basic elements of attention meditation - focus the consciousness mind on goals to align unconscious processes
<b>Course contents</b>	- Processing of information in the human brain - Consciousness and unconsciousness parts of the brain - Gaining consciousness control of primarily unconsciousness parts of the brain - Using skill full meditation techniques to improve business performance
<b>Prerequisites</b>	Completion of all previous MSE courses
<b>Assessment Methods</b>	- Continuous assessment
<b>Recommended Reading and Material</b>	- James Borg, "Mind Power", Pearson 2010 - Kazuo Inamori, "A Compass to Fulfillment", Mc Graw Hill 2010 - Heinz Hilbrecht, "Meditation und Gehirn", Schattauer, 2010 - Richard Bandler, "Veränderung des subjektiven Erlebens", Jungferner Verlag 2007, Original: "Using your brain - for a change", Real People Press, U.S. (August 1985) - Henry P. Stapp, "Mindful Universe" 2nd Edt Springer 2011 - Chade-Meng Tan "Search Inside Yourself" Optimierte dein Leben durch Achtsamkeit, Goldmann Verlag 2015
<b>Attendance</b>	Required
<b>Comments</b>	

# Sports Technology (MST)

## Instrumented material testing and testing systems

<b>Degree programme</b>	MST
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	5.00
<b>Incoming places</b>	Limited

<b>Course description</b>	
<b>Teaching methods</b>	
<b>Learning outcome</b>	After passing this course successfully students are able to ...
<b>Course contents</b>	
<b>Prerequisites</b>	
<b>Assessment Methods</b>	
<b>Recommended Reading and Material</b>	
<b>Attendance</b>	
<b>Comments</b>	

## Monitoring and feedback

<b>Degree programme</b>	MST
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	5.00
<b>Incoming places</b>	Limited

<b>Course description</b>	
<b>Teaching methods</b>	

<b>Learning outcome</b>	After passing this course successfully students are able to ...
<b>Course contents</b>	
<b>Prerequisites</b>	
<b>Assessment Methods</b>	
<b>Recommended Reading and Material</b>	
<b>Attendance</b>	
<b>Comments</b>	

## Mobile data capturing

<b>Degree programme</b>	MST
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	
<b>Teaching methods</b>	
<b>Learning outcome</b>	After passing this course successfully students are able to ...
<b>Course contents</b>	
<b>Prerequisites</b>	
<b>Assessment Methods</b>	
<b>Recommended Reading and Material</b>	
<b>Attendance</b>	
<b>Comments</b>	

## Machine Learning

<b>Degree programme</b>	MST
<b>Semester</b>	2
<b>Course methods</b>	ILV

<b>Language</b>	English
<b>ECTS Credits</b>	2.00
<b>Incoming places</b>	Limited

<b>Course description</b>	
<b>Teaching methods</b>	
<b>Learning outcome</b>	After passing this course successfully students are able to ...
<b>Course contents</b>	
<b>Prerequisites</b>	
<b>Assessment Methods</b>	
<b>Recommended Reading and Material</b>	
<b>Attendance</b>	
<b>Comments</b>	

## Statistics and Qualitymanagement

<b>Degree programme</b>	MST
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	5.00
<b>Incoming places</b>	Limited

<b>Course description</b>	
<b>Teaching methods</b>	
<b>Learning outcome</b>	After passing this course successfully students are able to ...
<b>Course contents</b>	
<b>Prerequisites</b>	
<b>Assessment Methods</b>	
<b>Recommended Reading and Material</b>	
<b>Attendance</b>	

<b>Comments</b>	
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## Sports technology project 2

<b>Degree programme</b>	MST
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	2.00
<b>Incoming places</b>	Limited

<b>Course description</b>	
<b>Teaching methods</b>	
<b>Learning outcome</b>	After passing this course successfully students are able to ...
<b>Course contents</b>	
<b>Prerequisites</b>	
<b>Assessment Methods</b>	
<b>Recommended Reading and Material</b>	
<b>Attendance</b>	
<b>Comments</b>	

## Sports practice measurement week - summer

<b>Degree programme</b>	MST
<b>Semester</b>	2
<b>Course methods</b>	SO
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	
<b>Teaching methods</b>	
<b>Learning outcome</b>	After passing this course successfully students are able to ...

<b>Course contents</b>	
<b>Prerequisites</b>	
<b>Assessment Methods</b>	
<b>Recommended Reading and Material</b>	
<b>Attendance</b>	
<b>Comments</b>	

## FEM in Sports Technology

<b>Degree programme</b>	MST
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	5.00
<b>Incoming places</b>	Limited

<b>Course description</b>	
<b>Teaching methods</b>	
<b>Learning outcome</b>	After passing this course successfully students are able to ...
<b>Course contents</b>	
<b>Prerequisites</b>	
<b>Assessment Methods</b>	
<b>Recommended Reading and Material</b>	
<b>Attendance</b>	
<b>Comments</b>	

## Start-up Management

<b>Degree programme</b>	MST
<b>Semester</b>	4
<b>Course methods</b>	VO
<b>Language</b>	English

<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	The course “Start-up Management” provides the essential methods and knowledge on how-) to develop a business idea and evaluate it using the Business Model Canvas, -) to evaluate a given business plan, -) to develop a business plan for a business idea, -) and to present a business model with a pitch deck.
<b>Teaching methods</b>	-) Theory lectures-) Video tutorials-) Material for self-study-) Teamwork-) Coaching sessions•Buzz groups•Feedback
<b>Learning outcome</b>	After passing this course successfully students are able to ... - -) develop an innovative business model, - -) evaluate it using the Business Model Canvas, and - -) present it with a pitch deck, - -) evaluate a given business plan - -) write a strategic business plan - -) get in contact with the startup scene
<b>Course contents</b>	- -) Why you need a business plan - -) How to write a business plan - -) Assumptions and estimates for a business plan - -) Where to find sample business plans and templates - -) Contents of a business plan - -) Evaluation of a given business plan - -) Business Model Canvas - -) Pitch deck - -) The Austrian start-up scene (incubators, business angels, investors, business plan competitions, etc.) - -) Team coachings
<b>Prerequisites</b>	Understanding the principles of business administration.
<b>Assessment Methods</b>	- The students will work in teams of 3-4 and will be graded as follows: - -) How does the Austrian start-up scene look like? - 10% - -) Business Model Canvas - 50% - -) Pitch deck - 40%
<b>Recommended Reading and Material</b>	- Kailer/Weiß, Gründungsmanagement kompakt, aktuelle Auflage - Genadinik, Alex, Business Plan Template And Example: How To Write A Business Plan: Business Planning Made Simple. Semantic Valley LLC. - Osterwalder, Alexander; Pigneur, Yves. Business Model

	Generation: A Handbook for Visionaries, Game Changers, and Challengers. Wiley
<b>Attendance</b>	Attendance is generally recommended.
<b>Comments</b>	

## Digital Leadership and New World of Work

<b>Degree programme</b>	MST
<b>Semester</b>	4
<b>Course methods</b>	VO
<b>Language</b>	English
<b>ECTS Credits</b>	2.00
<b>Incoming places</b>	Limited

<b>Course description</b>	In the course Digital Leadership and New World of Work, students gain practical insights into the leadership and transformation challenges e.g. in international organizations and develop a new view of the new world of work and the theme of leadership
<b>Teaching methods</b>	Contents are independently researched, presented and discussed. Lecturers and students systematically compare the results of their work with their practical experience. In this way, acquired knowledge is placed in relation to one's own work situation.
<b>Learning outcome</b>	After passing this course successfully students are able to ... - to outline the most important trends on the labour market and in HR management - to weigh the advantages and disadvantages of different leadership theories and concepts - to motivate employees and lead virtual teams in an increasingly digitalized world of work - to weigh the advantages and disadvantages of traditional and agile organizational structures (e. g. Holacracy etc. ) - to design digital education measures for lifelong learning
<b>Course contents</b>	- Trends in the economy: globalization, digital transformation and Industry 4.0 etc. - Trends on the labour market: demographic change, diversity, changing values etc. - Trends in HR management (e. g. talent Management, digital HR, new organisations, age management, diversity management etc.



	<ul style="list-style-type: none"> <li>- Traditional theories of property, behavior and situation of leadership</li> <li>- Modern leadership concepts (e. g. transformational leadership, agile leadership, servant leadership, etc. )</li> <li>- Leadership from a distance</li> <li>- Agile organizational models (e.g. Scrum, Holacracy etc.)</li> <li>- Competence requirements and transfer in the digitalised world of work</li> </ul>
<b>Prerequisites</b>	no special prior knowledge required, practical work experience helpful
<b>Assessment Methods</b>	- Course immanent assessment method and written reflection (grade)
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Franken, Swetlana (2016): Führen in der Arbeitswelt der Zukunft, SpringerGabler</li> <li>- Petry, Thorsten (2016): Digital Leadership. Erfolgreiches Führen in Zeiten der Digital Economy, Haufe Fachbuch</li> </ul>
<b>Attendance</b>	Attendance is compulsory
<b>Comments</b>	none

## Healthcare and Rehabilitation Technology (MGR)

### Wahlfach - Introduction to MATLAB for Applications in Life Sciences

<b>Degree programme</b>	MGR
<b>Semester</b>	2
<b>Course methods</b>	SO
<b>Language</b>	English
<b>ECTS Credits</b>	1.50
<b>Incoming places</b>	Limited

<b>Course description</b>	<p>This course freely follows the previous introduction to MATLAB for Applications in Life Sciences (MLS1) and furthermore deepens the foundations of selected chapters from the field of life sciences. At the end of the course, students should be able to use MATLAB in their own work for purposes of processing presented signals/biosignals. The course consists of interactive lectures with students solving sample MATLAB problems ranging in difficulty. Individual topics can be introduced into the course setup.</p>
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<b>Teaching methods</b>	Interactive lectures about selected topics from the field of Life Sciences, Practical solution of assignments by students supported by lecturer, Project consultations
<b>Learning outcome</b>	After passing this course successfully students are able to ... <ul style="list-style-type: none"> <li>- Use MATLAB for data manipulation and visualization</li> <li>- Generate signals and perform basic signal operations in MATLAB</li> <li>- Create and use basic digital filters to process signals in MATLAB</li> <li>- Apply gained knowledge and techniques to analyse specific biomedical signals (ECG/EMG etc.)</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Signals classification and properties</li> <li>- Operations with signals and signal generation</li> <li>- Design of digital filters</li> <li>- Biosignal analysis</li> </ul>
<b>Prerequisites</b>	Basic programming knowledge, General knowledge from Life Sciences on bachelor level
<b>Assessment Methods</b>	- Activity during lectures
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- V.K. Ingle and J. G. Proakis, Digital Signal Processing Using MATLAB, 1st ed. Pacific Grove, USA: Brooks/Cole Pub. Co., 1999</li> <li>- A. B. Biran, What Every Engineer Should Know About Matlab and Simulink. New York: Taylor &amp; Francis Group, 2010.</li> </ul>
<b>Attendance</b>	Attendance is mandatory, only 20% of absence is tolerated
<b>Comments</b>	

## Tissue Engineering and Regenerative Medicine (MTE)

### Gene Regulation and Signal Transduction

<b>Degree programme</b>	MTE
<b>Semester</b>	2
<b>Course methods</b>	VO
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	This course provides necessary information to understand cellular signalling and how genes are regulated. The topics cover aspects of signal transduction in the context of tissue engineering and
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	regenerative medicine.
<b>Teaching methods</b>	Lecture presenting basics and applied examples.
<b>Learning outcome</b>	After passing this course successfully students are able to ... - explain the basic principles of DNA/protein interaction - specify components and regulation of important signaling pathways (e.g. Raf-MEK-ERK, PI3K-AKT-mTOR; apoptosis) and mechanisms of mechanotransduction - interpret and analyze results from typical signaling experiments (Western blots, IPs...) - explicate the relevance of signal transduction in Tissue Engineering - understand the basics of bioinformatics
<b>Course contents</b>	- signaling pathways (RAF-MEK-ERK, mTOR/AKT, Wnt/beta-catenin) - apoptosis - mechanotransduction - aspects of cellular signaling in Tissue Engineering - introduction to bioinformatics
<b>Prerequisites</b>	Molecular Biochemistry and Cell Biology
<b>Assessment Methods</b>	- final written exam
<b>Recommended Reading and Material</b>	- current scientific literature suggested by lecturers
<b>Attendance</b>	Attendance is mandatory in this course, only 20% of absence is tolerated. In case more than 20% are missed the first try in the exam is lost.
<b>Comments</b>	

## Study Design and Biostatistics

<b>Degree programme</b>	MTE
<b>Semester</b>	2
<b>Course methods</b>	VO
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	The first part of the course provides an overview including details of different study design concepts. Subsequently, some selected parts
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	of biostatistics are discussed. Additionally students present scientific literature in an oral presentation and receive detailed feedback on their presentation skills.
<b>Teaching methods</b>	- Lecture format- Occasional take-home readings- Discussions in classroom
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- define general rules/key points of an appropriate study design</li> <li>- identify types of models/study design approaches utilized in various areas of pre- and clinical research</li> <li>- define and critically assess the influence of key advantages and weaknesses of most commonly modeling systems used in pre- and clinical research</li> <li>- define basic rules/definitions used in biomedical descriptive statistics</li> <li>- perform a critical preliminary assessment of (quantitative) data as well as selection of appropriate tests for statistical evaluation of (quantitative) data</li> <li>- define most common do's and don't's in a power point presentation</li> <li>- define/practically apply the optimal tactics for an effective scientific meeting-type talk</li> <li>- apply a "damage control" in the post-talk question/answer period</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Study design overview for 1) in vitro, 2) in vivo and 3) clinical study sections</li> <li>- Detailed description of study types, their applicability and pro-and cons for each section.</li> <li>- Selected (introductory) study design-related aspects of biostatistics: types of data, distributions/normality, hypothesis testing, data transformation, appropriate approach/selection of statistical tests</li> <li>- Curriculum also includes graded data presentation training (a.k.a. Power Talk Training) by students in a form of a 10min power point (PP) talk/each (followed by a detailed feedback from the lecturer)</li> </ul>
<b>Prerequisites</b>	- An open mind and mental flexibility- Positive thinking and eagerness to interact with the lecturer- Knowledge of the basic statistical concepts is useful
<b>Assessment Methods</b>	- Final grade will combine 50% of the test score and 50% of the PP talk.
<b>Recommended Reading and Material</b>	
<b>Attendance</b>	Attendance is mandatory in this course, only 20% of absence is

	tolerated. In case more than 20% are missed the first try in the exam is lost.
<b>Comments</b>	Students must get approval of the topics to present from the lecturer; titles/topics need to be sent to the lecturer at least 3 days before the scheduled talk. The order of individual talks is to be decided by students.

## Ethics in Engineering and Medicine

<b>Degree programme</b>	MTE
<b>Semester</b>	2
<b>Course methods</b>	SE
<b>Language</b>	English
<b>ECTS Credits</b>	1.00
<b>Incoming places</b>	Limited

<b>Course description</b>	The course imparts basic knowledge of bioethics to the students. Ethical questions in bioengineering and biomedicine including their impacts on society and the training of ethical decision-making and argumentation take center stage.
<b>Teaching methods</b>	
<b>Learning outcome</b>	After passing this course successfully students are able to ... - outline selected basic terms and principles of biomedical ethics (for example moral status, allocation ethics, concepts of health and disease/disabilities) by the means of simple examples. - apply ethical standards to latest research developments in selected actual case studies in bioengineering and biotechnology. - describe the steps of ethical decision-making and argumentation and to apply them in selected case studies for ethical assessment of conflicting issues in the field of biomedical research and medicine
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Fundamental positions of bioethical decision-making and argumentation</li> <li>- Experiments with human subjects and animals</li> <li>- Ethics issues of resource allocation</li> <li>- Ethical concepts to health-disease/illness-disabilities</li> <li>- Intercultural ethical aspects of bioengineering and biotechnology</li> <li>- Medical information systems (e-health, data security, privacy, confidentiality)</li> </ul>

<b>Prerequisites</b>	none
<b>Assessment Methods</b>	- Course immanent assessment method (grade)
<b>Recommended Reading and Material</b>	- Literature at the beginning of the course
<b>Attendance</b>	Attendance is compulsory according to the statutes
<b>Comments</b>	Contentual coordination with the English course in which issues of bioethics are treated as well

## Biotechnology

<b>Degree programme</b>	MTE
<b>Semester</b>	2
<b>Course methods</b>	ILV
<b>Language</b>	English
<b>ECTS Credits</b>	3.00
<b>Incoming places</b>	Limited

<b>Course description</b>	Design and optimization of recombinant protein production
<b>Teaching methods</b>	Basics and theory are presented within an interactive lecture. Practical examples for application are discussed.
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- Bioprocess design for the production of recombinant proteins from gene to purified product applying microbial and/or mammalian systems</li> <li>- Choice of appropriate expression systems and plasmids for recombinant production</li> <li>- Definition of strategies for product development and expression systems</li> <li>- Characterization of concept and principle of bioprocess design (up- and downstream processing)</li> <li>- Design and characterization of various bioreactor types</li> <li>- Application of high-level data exploration and interpretation</li> <li>- Combination of gained knowledge with scientific state of the art</li> <li>- Characterization, interpretation, and application of function and interactivity of complex systems</li> </ul>
<b>Course contents</b>	- Recombinant protein production: (1) Basics and expression strategies

	<ul style="list-style-type: none"> <li>- Expression hosts: (1) overview: Pro- and eukaryotic expression systems</li> <li>- Upstream Processing (USP): (1) Mass balance and kinetics, (2) Process modes (batch, fed-batch, continuous), (3) Bioreactor types and bioreactor design (mass transfer), (4) Process monitoring and control</li> <li>- Downstream Processing (DSP): (1) DSP design, (2) DSP Unit operations: A) Cell separation (centrifugation, filtration) and cell disintegration, B) Protein Purification (Chromatography)</li> <li>- Continuous manufacturing: (1) USP, DSP and analytics</li> <li>- Multivariate data analysis: (1) Design of Experiments (DoE)</li> </ul>
<b>Prerequisites</b>	Basics biology, mathematics, physics
<b>Assessment Methods</b>	- Written exam
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Bioprocess Engineering Principles, Pauline M Doran, 2nd edition ISBN 978-0-12-220851-5</li> <li>- Bioprozesstechnik, Horst Chmiel, ISBN 978-3-8274-2476-1</li> <li>- Taschenatlas der Biotechnologie und Gentechnik, Rolf D. Schmid ISBN 978-3-527-33514-5</li> </ul>
<b>Attendance</b>	
<b>Comments</b>	

## Power Electronics (MLE)

### Intercultural Communications

<b>Degree programme</b>	MLE
<b>Semester</b>	2
<b>Course methods</b>	SE
<b>Language</b>	English
<b>ECTS Credits</b>	1.50
<b>Incoming places</b>	Limited

<b>Course description</b>	We aim at raising intercultural awareness and broadening the students' horizons
<b>Teaching methods</b>	
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- meet the challenges of communicating with members of other</li> </ul>

	cultures - recognize the potential of working in an intercultural team - act flexibly and confidently in an unknown environment
<b>Course contents</b>	- Terms and theories of culture: Johari window, Iceberg theory etc. - Manifestations of culture - Inside and outside perspectives on culture
<b>Prerequisites</b>	Completion of previous semester courses
<b>Assessment Methods</b>	- Grade depends on: - Attendance - Presentation of an intercultural aspect in class - Participation in class discussions
<b>Recommended Reading and Material</b>	- Lewis, R.D. et al (2012) When Cultures Collide 3rd ed., Nicholas Brealey International - Additional current handouts and audio-visual support
<b>Attendance</b>	Attendance is compulsory
<b>Comments</b>	

## Internet of Things and Smart Systems (MIO)

### IT- and Data Protection Law

<b>Degree programme</b>	MIO
<b>Semester</b>	2
<b>Course methods</b>	SE
<b>Language</b>	German
<b>ECTS Credits</b>	5.00
<b>Incoming places</b>	Limited

<b>Course description</b>	
<b>Teaching methods</b>	
<b>Learning outcome</b>	After passing this course successfully students are able to ... - explain the main features of concluding a contract on the Internet - move in online trade in a legally secure way and to know the essential deadlines - design an imprint on the homepage and - use digital content and avoid copyright infringement, for example



	<p>when using images and setting links</p> <ul style="list-style-type: none"> <li>- explain the basic concepts of data protection laws</li> <li>- identify which data may be processed in accordance with DSGVO and DSG and which must be deleted</li> <li>- create a data processing register</li> <li>- obtain a GDPR-compliant consent from a person</li> <li>- identify the processing principles of the GDPR and apply them to internal operations.</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Conclusion of contract on the Internet</li> <li>- Consumer Protection Directive and Distance and Off-Site Selling (FAGG)</li> <li>- E-Commerce Act (ECG)</li> <li>- Signature Act</li> <li>- Data protection law, Data Protection Regulation (DSGVO)</li> <li>- Basics of copyright</li> <li>- Use of digital content</li> <li>- Telecommunications law (TKG)</li> </ul>
<b>Prerequisites</b>	
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Final written exam</li> <li>- Oral presentation on a recent judgment.</li> </ul>
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Jahnel/Mader/Stauddegger, IT-Recht, 4. Auflage (2020)</li> <li>- Jahnel/Pallwein-Prettner/Marzi, Datenschutzrecht, 2. Auflage (2020)</li> <li>- Case-by-case recommended literature essays</li> </ul>
<b>Attendance</b>	
<b>Comments</b>	

## Data Analysis

<b>Degree programme</b>	MIO
<b>Semester</b>	2
<b>Course methods</b>	LAB
<b>Language</b>	German
<b>ECTS Credits</b>	5.00
<b>Incoming places</b>	Limited

<b>Course description</b>	
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<b>Teaching methods</b>	
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- prepare, visualize and evaluate structured data sets with selected tools</li> <li>- read a data set into an iPython notebook, prepare it in this development environment, and explore it using descriptive statistics and selected statistical methods.</li> <li>- identify relationships between a dependent variable and one or more independent variables and develop a predictive model using regression techniques.</li> <li>- classify data points in multidimensional feature space using simple and supervised learning techniques (nearest neighbors, decision trees)</li> <li>- evaluate and improve the performance of classification and regression methods</li> <li>- cluster data points in multidimensional feature space using kMeans method and determine the optimal number of clusters.</li> <li>- select an appropriate learning procedure for a case study with real data to build a predictive model</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Data preparation, visualization and evaluation</li> <li>- Use of Python in Data Science</li> <li>- Correlation and regression analysis</li> <li>- Time series analysis</li> <li>- Classification</li> <li>- Performance evaluation and improvement</li> <li>- Cluster analysis</li> </ul>
<b>Prerequisites</b>	
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Immanent performance review (intermediate tests, 30%)</li> <li>- Final exam (theory, practical tasks, 70%)</li> </ul>
<b>Recommended Reading and Material</b>	- McKinney, W. (2017). Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython (2nd ed). O'Reilly Media
<b>Attendance</b>	
<b>Comments</b>	

## Security

<b>Degree programme</b>	MIO
<b>Semester</b>	2

<b>Course methods</b>	LAB
<b>Language</b>	German
<b>ECTS Credits</b>	5.00
<b>Incoming places</b>	Limited

<b>Course description</b>	
<b>Teaching methods</b>	
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- characterize cryptographic mechanisms and compare them with respect to the required protection goals</li> <li>- describe and design mechanisms, concepts and models of access control with regard to identification, authentication as well as rights management</li> <li>- explain the requirements of secure communication (networks, services, distributed applications) and describe the procedures and protocols required for this purpose.</li> <li>- explain software security and categorize common vulnerabilities and threats/malware.</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Consolidation of the basics of cryptographic methods</li> <li>- Authentication</li> <li>- Access and access control</li> <li>- Security in networks</li> <li>- Internet Security</li> <li>- Software Security</li> </ul>
<b>Prerequisites</b>	
<b>Assessment Methods</b>	- Immanent Performance Assessment, Final Examination.
<b>Recommended Reading and Material</b>	- Stallings, William: Computer Security – Principles & Practice, Pearson, 3/E, ISBN: 9781292066172
<b>Attendance</b>	
<b>Comments</b>	

## IoT Technologies

<b>Degree programme</b>	MIO
<b>Semester</b>	2
<b>Course methods</b>	ILV

<b>Language</b>	German
<b>ECTS Credits</b>	5.00
<b>Incoming places</b>	Limited

<b>Course description</b>	
<b>Teaching methods</b>	
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- explain IoT specific technologies as well as protocols</li> <li>- verify differences between these and other communication protocols (Internet protocols, e.g.) and to select the correct protocol for a specific application.</li> <li>- specify the requirements for technologies and protocols of an IoT system.</li> <li>- evaluate commercial solutions for IoT systems, to work out the pros and disadvantages as a basis for decision-making.</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Introduction to IoT systems and their technologies (wireless technologies such as 5G, WiFi 802.11, 802.15.4: ZigBee, e.g.).</li> <li>- Existing solutions for connecting nodes (LoRa, WAN, ...)</li> <li>- Commercial cloud backends and opensource solutions</li> <li>- The basics of the essential IoT technologies: <ul style="list-style-type: none"> <li>o IoT specific protocols (MQTT, CoAP, ...).</li> <li>o IIoT specific technologies ("Software-Defined Industrial Systems", OPC UA)</li> <li>o Wired technologies (Ethernet and extensions in the area of QoS/TSN)</li> </ul> </li> <li>- Edge-Computing vs. Cloud-Computing vs. OnPremises</li> <li>- Energy and bandwidth optimization for IoT transmission</li> <li>- Tradeoffs: latency vs. bandwidth vs. energy consumption</li> <li>- Power supply of IoT devices (battery, power grid, energy harvesting, ...)</li> </ul>
<b>Prerequisites</b>	
<b>Assessment Methods</b>	<ul style="list-style-type: none"> <li>- Immanent performance review (active participation/intermediate tests, 40%)</li> <li>- Final exam (theory, practical tasks, 60%)</li> </ul>
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- Prof. Dr. rer. nat. Felix Hüning (2018), Embedded Systems für IoT, Springer Vieweg, © Springer-Verlag GmbH Deutschland.</li> <li>- Martin Sauter (Februar, 2018): Grundkurs Mobile Kommunikationssysteme; LTE-Advanced Pro, UMTS, HSPA, GSM - GPRS, Wireless LAN und Bluetooth, 7. Auflage, Springer Vieweg, © Springer-Verlag GmbH Deutschland</li> </ul>

<b>Attendance</b>	
<b>Comments</b>	

## Sensor-/Actor Systems & Control Theory

<b>Degree programme</b>	MIO
<b>Semester</b>	2
<b>Course methods</b>	LAB
<b>Language</b>	German
<b>ECTS Credits</b>	5.00
<b>Incoming places</b>	Limited

<b>Course description</b>	
<b>Teaching methods</b>	
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- identify control technology components</li> <li>- describe, simulate and analyze control processes mathematically</li> <li>- plan and simulate simple control systems</li> <li>- apply control technology components in selected examples</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Basics of control engineering</li> <li>- Types of sensors and actuators</li> <li>- Fundamentals of control engineering</li> <li>- Mathematical mapping of control loops</li> <li>- Analysis of control processes in MATLAB</li> <li>- Design of controllers in the frequency domain</li> <li>- Difference analog and digital controls</li> <li>- State controller/multivariable controller and state observer</li> <li>- Realization of regulations</li> <li>- Scanning during measurements</li> <li>- Which sensor is suitable for which application (measuring ranges)</li> <li>- Limits of sensors (e.g. humidity, sea level, ...)</li> </ul>
<b>Prerequisites</b>	
<b>Assessment Methods</b>	- Ongoing practical examples and final theoretical exam
<b>Recommended Reading and Material</b>	<ul style="list-style-type: none"> <li>- O. Föllinger, Regelungstechnik: Einführung in die Methoden und ihre Anwendung, VDE Verlag, 12. Auflage, 2016</li> <li>- N. Große, W. Schorn, Taschenbuch der praktischen Regelungstechnik, Carl Hanser Verlag, 2006</li> </ul>

	- V. Plenck, Grundlagen der Automatisierungstechnik kompakt, Springer Verlag Vieweg, 2019
<b>Attendance</b>	
<b>Comments</b>	

## IoT Systems Development

<b>Degree programme</b>	MIO
<b>Semester</b>	2
<b>Course methods</b>	LAB
<b>Language</b>	German
<b>ECTS Credits</b>	5.00
<b>Incoming places</b>	Limited

<b>Course description</b>	
<b>Teaching methods</b>	
<b>Learning outcome</b>	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> <li>- dimension and program sensor nodes.</li> <li>- select the correct sensor nodes and software environment (bare-metal vs. OS-based) for a given application.</li> <li>- design and integrate sensor clusters.</li> <li>- enable efficient communication within sensor clusters.</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>- Design &amp; Development of distributed sensor networks</li> <li>- Integration of local sensor networks to cluster using edge-gateways</li> <li>- Basic concepts of Communication between nodes of Concurrency (multithreading, multiprocessing, distributed systems) of Synchronization of multiple nodes of Data communication in a sensor cluster</li> <li>- Practical implementation of IoT systems</li> <li>- Practical implementation and application of communication structures</li> </ul>
<b>Prerequisites</b>	
<b>Assessment Methods</b>	- Ongoing practical projects with final delivery discussion and final theoretical examination
<b>Recommended Reading and Material</b>	- Current manufacturer documentation as well as technical and scientific publications, depending on the used platform and current task

<b>Attendance</b>	
<b>Comments</b>	