

UAS Technikum Wien

COURSE GUIDE SS2023 COURSES OFFERED IN ENGLISH

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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.

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!

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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)
Bachelor	
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
Master	
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)

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

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

Course description	<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 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.</p> <p>The course methodology and contents will be similar to the ASSIST HEIDI summer school 2022.</p>
Teaching methods	Co-Design, Problem-based learning
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - understand daily challenges of people with disabilities - understand and apply the principles of co-design - understand types and causes of disabilities - know the current technical aids to support people with disabilities and to be able to select suitable technologies for certain applications - design and implement assistive prototypes using rapid prototyping, microcontrollers or computer vision / ML
Course contents	At the beginning of the course the students will be introduced to

	<p>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.</p> <p>In parallel, several topics will be covered including small exercises:</p> <ul style="list-style-type: none"> - Physiological basics, Types and causes of disabilities - Assistive tools - Rapid Prototyping - Computer vision + ML with python - Arduino microcontroller <p>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.</p>
Prerequisites	Programming, English
Assessment Methods	<p>2 x Assignments á 10% = 20%</p> <p>1 x Project work (graded as group work) 80%</p>
Recommended Reading and Material	<p>Author: Dr. Wolfgang L. Zagler, Title: Rehabilitationstechnik, Date: March 1, 2008, Location: Vienna, Austria, Book URL: https://studyathome.technikum-wien.at:8092/</p>
Attendance	Attendance is mandatory in classes on campus.
Comments	

International Marketing

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

Course description	<p>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</p>
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	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;
Teaching methods	Self-study, lecture, distance learning, case studies, group projects
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - discuss motives and triggers why firms go international - evaluate the factors influencing a firm's international competitiveness - define international market selection and identify the problems related with it - evaluate the factors to consider when choosing a market entry strategy - design global marketing programs - contribute to strategic marketing decisions - understand and contribute to marketing mix decisions
Course contents	<ul style="list-style-type: none"> - Internationalization process - Market segmentation - Creating competitive advantage - Global marketing communication - Market selection process - Brand building - Marketing Mix decisions
Prerequisites	none
Assessment Methods	<ul style="list-style-type: none"> - Written examination (70%) - Group Assingment (30%)
Recommended Reading and Material	<ul style="list-style-type: none"> - Global Marketing, Hollensen, 2016 - International Marketing, Czinkota , Ronkainen 2012 - Strategic Brand Management, Keller 2013
Attendance	Attendance is compulsory.
Comments	Detailed information regarding the course is provided via Moodle.

Building and Solar Energy

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

Course description	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.
Teaching methods	Project-Based Learning method. Combined with lectures and practical teaching on the remote laboratories. Supported by virtual learning environment and simulation.
Learning outcome	After passing this course successfully students are able to ... <ul style="list-style-type: none"> - Design preliminary concepts and design of energy efficient building supported by solar energy - Simulation of a solar energy system - Possibilities of building integrated photovoltaics and construction design - Overview of the market, drivers, stakeholders for integration of affordable renewable energy systems
Course contents	<ul style="list-style-type: none"> - Energy characterization and energy planning of solar building - Designing a building-integrated photovoltaic installation by software tools - Measurement and analysis of solar systems in the lab - Best practice of solar design (Excursion) - Overview of the market, legislative and drivers for solar energy and buildings
Prerequisites	Basic knowledge at least in one or two of the following topics: - Building construction - Solar energy system - Energy planning of buildings
Assessment Methods	<ul style="list-style-type: none"> - Lecture notes - Grading of practical session - Project reports
Recommended Reading and Material	<ul style="list-style-type: none"> - Cost Optimal and Nearly Zero-Energy Buildings (nZEB) Definitions, Calculation Principles and Case Studies, Editors: Kurnitski, Jarek (Ed.) - Designing with Solar Power: Source book for Building Integrated Photovoltaics. D. Prasad, M. Snow Routledge

	<p>- Modeling, Design, and Optimization of Net-Zero Energy Buildings Athienitis (Ed.), W.O'Brien (Ed.), ISBN: 978-3-433-03083-7, February 2015</p> <p>- Building integrated photovoltaics: A handbook S. Roberts and N. Guariento, Editors: Springer</p>
Attendance	Attendance is mandatory in this course, only 20% of absence is accepted.
Comments	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

Mobile Robotics

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

Course description	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.
Teaching methods	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.
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - 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
Course contents	- Introduction to Mobile Robotics

	- Develop ROS nodes for robot applications
Prerequisites	Mandatory: Programming in C++ and/or Python; Basic Linux Skills (there are warm-up slides) Recommended: Computer Vision Basics
Assessment Methods	<ul style="list-style-type: none"> - Homework: 20% - Moodle Quizzes: 20% - Moodle Forum: 5% - Projekt: 55%
Recommended Reading and Material	<ul style="list-style-type: none"> - O'Kane: A Gentle Introduction To ROS, 2.1.6, 2018, https://www.cse.sc.edu/~jokane/agitr/ - http://wiki.ros.org/
Attendance	
Comments	This course requires a (reasonably) powerful computer:- min i5 (7th gen.)- 8GB RAM (Ubuntu) 16GB RAM (Windows)

Data Ethics and Open Data

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

Course description	<p>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.</p>
Teaching methods	The course consists of - lectures combined with discussions - project

	work and exercises
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - analyse and work with Open Data - determine different fields of Open Data applications - assess the quality of different Open Data sources - value the importance of responsible handling of data in different areas of application - discuss domain-related data ethics - analyse and describe the challenges and risks of an intelligent machine learning system (AI)
Course contents	<ul style="list-style-type: none"> - Open Data applications in different fields: Healthcare, finance, Smart Cities etc. - Open Data formats - Open Data policies - Project: analysing and processing open data - Data Ethics - Data Privacy, Transparency
Prerequisites	Basic Knowledge in Web Technologies, Database Systems, and Data Management
Assessment Methods	<ul style="list-style-type: none"> - Participation in discussions and presentation (Data Ethics) - Project results and project presentation (Open Data)
Recommended Reading and Material	<ul style="list-style-type: none"> - Ethics Advisory Group (2018): Ethics Advisory Group Report 2018 - European Union (2017): Open Data Maturity in Europe 2017 - Specific papers related to domains - Open data Web sites and catalogues (e.g. https://open.wien.gv.at)
Attendance	Attendance is mandatory
Comments	Course Details will be provided in Moodle.

Service and object-oriented Algorithms in Robotics

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

Course description	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).
Teaching methods	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
Learning outcome	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
Course contents	- Short outline of basic robot programming conceptsmased on a robot's kinematics, actors sensors and control concepts - C++ - ROS
Prerequisites	Mandatory: - Sensor technology - Basic programming skills, in particular in C - Sensor technology
Assessment Methods	- 70% final exam - 30% exercises
Recommended Reading and Material	- http://wiki.ros.org/ROS/Tutorials - Bishop, C.M.; Pattern Recognition and Machine Learning, 2006
Attendance	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.
Comments	

CI_German Language & Austrian Culture A2

Degree programme	ECI
Semester	2

Course methods	ILV
Language	English
ECTS Credits	3.00
Incoming places	Limited

Course description	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
Teaching methods	group work, role play, text production, homework
Learning outcome	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
Course contents	- 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
Prerequisites	A1
Assessment Methods	
Recommended Reading and Material	- will be announced after an assessment test in the first lesson
Attendance	
Comments	

CI_Renewable Energy Laboratory

Degree programme	ECI
Semester	2
Course methods	ILV

Language	English
ECTS Credits	3.00
Incoming places	Limited

Course description	Experimental setup of different means of measuring methods to evaluate the performance of renewable energy technologies and systems.
Teaching methods	Laboratory exercises in small groups of typically 8-12 students
Learning outcome	After passing this course successfully students are able to ... <ul style="list-style-type: none"> - measure and analyze the energetic performance of components of energy conversion systems and measure and interpret the power quality of energy networks - measure and analyze the energetic performance of heat pumps, - measure and analyze the energetic performance of thermal solar plants and photovoltaic plants, - measure certain parameters of ventilation and hydraulic systems and interpret it.
Course contents	<ul style="list-style-type: none"> - 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
Prerequisites	Basics in: - Electrical machines - Mechanical engineering - Thermodynamics - Instrumentation
Assessment Methods	<ul style="list-style-type: none"> - Laboratory notes - Laboratory reports - Grading of practical session - Laboratory reports
Recommended Reading and Material	- Scripts of the lecturers
Attendance	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.
Comments	

CI_Electronic Laboratory

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

Course description	This integrated course provides students the opportunity to calculate and build electronic circuits, as well as measuring their characteristics with modern measuring devices.
Teaching methods	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.
Learning outcome	After passing this course successfully students are able to ... <ul style="list-style-type: none"> - measure voltages and currents with a DMM and oscilloscope correctly - produce signals with the Function Generator - calculate electronic circuits, build them and measure their outputs and characteristics - measure the output of circuits involving resistors, capacitors, diodes and OpAmps with the oscilloscope
Course contents	<ul style="list-style-type: none"> - Oscilloscope and Function Generator - Kirchhoff laws - Diode and Zener Diode - DC Power supply design and implementation - OpAmp circuits - RC Circuit: DC and AC analysis - Transistor Amplifiers - Project: Audio Equaliser
Prerequisites	Students should have basic knowledge of electronics and electronic circuits.
Assessment Methods	<ul style="list-style-type: none"> - The students will be assessed according to how far they completed the experiment at hand.
Recommended Reading	- Maxfield et al., "Electrical Engineering know it all", Newnes &

and Material	Elsevier, 2008. - Scripts and materials provided by the lecturer.
Attendance	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.
Comments	

CI_Building Climate Engineering

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

Course description	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.
Teaching methods	Lectures combined with practical teaching on the construction site of an energy efficient building.
Learning outcome	After passing this course successfully students are able to ... - analyze different building construction components, facades and window concerning their energy efficiency, comfort and building physics, - design preliminary concepts of energy efficient projects, - overview possibilities of ventilation, heating and cooling, - compare different construction techniques concerning energy efficiency, building quality and comfort, especially related to their home country.
Course contents	- Basics of building physics, heat, humidity and sound protection - Building construction components from the view point of building physics and energy efficiency, comparison on international basis - Heating, cooling and ventilation possibilities, - Energy benchmark levels, calculating of the energy demand of buildings

Prerequisites	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
Assessment Methods	- Combined written and oral exam, written exam in 2-3 examples 40% Cooperation, attendance 20% - Project including energy layout and a short planning example of heating, ventilation and/or cooling 40%
Recommended Reading and Material	- 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
Attendance	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.
Comments	

CI_Audio Engineering

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

Course description	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.
Teaching methods	The Lecturer will explain some basic concepts. The students will compete tasks in the computer using Matlab.
Learning outcome	After passing this course successfully students are able to ... - Understand the signal chain in a typical audio application, and be able to recognise and avoid distortions in all stages - understand how humans perceive sound, - record sounds using the appropriate equipment, - measure different attributes of sound and understand how they correlate to human perception,

	<ul style="list-style-type: none"> - analyse and interpret recorded sounds - synthesise sounds with specific attributes - perform audio processing on recordings - understand how audio compression works
Course contents	<ul style="list-style-type: none"> - Sound and sound attributes - Human perception of sound - Signal chain in audio engineering - Microphones and amplifiers - Analog vs digital signals - Fourier Analysis, Spectrum, Spectrogram - Synthesis of sounds - Filters - Audio compression - Loudspeakers
Prerequisites	Basic programming skills. Matlab knowledge advantageous.
Assessment Methods	- The students will be assessed according to how far they completed the task at hand
Recommended Reading and Material	- Script provided by the lecturer
Attendance	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.
Comments	

CI_German Language & Austrian Culture A1

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

Course description	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,
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	question and negation, modal verbstopics: me and the others, people and things, student's life, living,shopping
Teaching methods	group work, role plays, text production, excursion
Learning outcome	After passing this course successfully students are able to ... - master everyday situations in German
Course contents	- 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
Prerequisites	None
Assessment Methods	- mid term test, final test, performance in class, homework
Recommended Reading and Material	- 1.)Panorama; Deutsch als Zweitsprache Kursbuch A1.1 ISBN 978-3-06-120472-3; 2.) Übungsbuch A1.1. ISBN 978-3-06-120602-4
Attendance	minimum of 75 % required
Comments	

CI_German Language & Austrian Culture B2

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

Course description	Repetition, perfection and exercises of relevant grammatical structures • Vocabulary and useful phrases for B2 • Economy / career / work • New technology • Modern life / society
Teaching methods	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.
Learning outcome	After passing this course successfully students are able to ... - understand grammatically complex texts which are rich in

	<p>vocabulary on the level B2</p> <ul style="list-style-type: none"> - write a summary and comment the main topics of a text. <p>Furthermore you have developed and enlarged your knowledge of German for the purpose of your studies</p> <ul style="list-style-type: none"> - You have improved and clarified your writing skills as well as you can refer to phrases of argumentation. - describe and comment graphics and you can take a critical point of view in the context of a text. - write a request, a letter of complaint with the appropriate register
Course contents	<ul style="list-style-type: none"> - Reading of press articles and exercises in global and close reading as well as training of vocabulary and grammar - Writing summaries and expressing your point of view with the right expressions - Expressing advantages or disadvantages - Writing a letter of complaint or a request with the right expressions - Reporting about texts, describing and commenting graphics in the context of an article - Making an interview in the context of your studies and writing about your learning outcome
Prerequisites	Only for students with a good knowledge of German who are interested in improving their writing skills
Assessment Methods	<ul style="list-style-type: none"> - 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) - 2) Exercises on Moodle (25 points) - 3) Active participation (25 points)
Recommended Reading and Material	- Texts and exercises on Moodle and handouts of the regular class.
Attendance	Compulsary
Comments	

CI_Scientific Writing

Degree programme	ECI
Semester	2

Course methods	ILV
Language	English
ECTS Credits	3.00
Incoming places	Limited

Course description	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.
Teaching methods	Exercises, peer-learning, talks, discussions, online-tasks
Learning outcome	After passing this course successfully students are able to ... <ul style="list-style-type: none"> - Define, describe, identify and evaluate academic resources - Describe and apply the common structure of a scientific paper - Discuss the different kinds of research questions and apply them to their field or research - Describe and discuss the common structure of a Bachelor's Thesis or Master's thesis - Write text according to common standards of academic writing
Course contents	- 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?
Prerequisites	Basic knowledge of scientific keyterms and principles.
Assessment Methods	- Course immanent assessment method and end exam
Recommended Reading and Material	- Leedy, Ormrod: Practical Research. Planning and Design. Pearson - Skern: Writing Scientific English. Facultas wuv UTB
Attendance	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.
Comments	

CI_Traffic Safety Culture and Mobility

Degree programme	ECI
Semester	1
Course methods	ILV

Language	English
ECTS Credits	3.00
Incoming places	Limited

Course description	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.
Teaching methods	Mandatory readings, individual investigation, presentations and group discussions in plenum and breakout sessions. Some frontal teaching.
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - 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 - understand local particularities and consider them for a safe movement during their stay in Vienna and beyond - gain basic understanding of important psychological concepts relevant for research of human factors in mobility (technology acceptance, emotions & aggression, perception). Those concepts can be operationalized and measured, thus considered for the students' own research
Course contents	<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:</p> <ul style="list-style-type: none"> •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

Prerequisites	None
Assessment Methods	<ul style="list-style-type: none"> - Reports on mandatory readings (30%) - active participation (30%) - Exam
Recommended Reading and Material	<ul style="list-style-type: none"> - Ward, N. J., Watson, B., & Fleming-Vogl, K. (Eds.). (2019). Traffic Safety Culture: Definition, Foundation, and Application. Emerald Group Publishing. - Shinar, D. (Ed.). (2017). Traffic safety and human behavior. Emerald Group Publishing. - Journal Transportation Research Part F - Journal of Transportation and Health
Attendance	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.
Comments	

Empowering Intercultural Teams for Success: Theory - Tactics – Solutions

Degree programme	ECI
Semester	2
Course methods	ILV
Language	English
ECTS Credits	2.00
Incoming places	Limited

Course description	<p>The course will be divided into two parts. The first of these (i) will be a theoretical section where students learn about the dangers of stereotyping, about the general qualities useful in an intercultural and international environment - and how to enhance them - , and about Hofstede's cultural dimensions and how they should be best approached and applied. Additionally, participants will learn how these cultural dimensions affect the central tasks of a team in a business environment such as negotiating, project management and communicating. The second part (ii) will consist of a practically focused workshop where participants apply the information they have learnt in part (i) to working in separate teams. These teams will be responsible for different subtasks and solve simple technical tasks in cooperation with each other. Here, the participants will learn the</p>
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	methods of dealing with differences in "cultural" decision-making processes, communication and working behaviour along with techniques to enhance their communicative ability in an English as a Lingua Franca (ELF) environment.
Teaching methods	Theoretical input, group workshops, teamwork, group discussions, independent research, participant preparation of written documents.
Learning outcome	After passing this course successfully students are able to ... - question their culturally formed stereotypes and prejudices; - reflect on different strategies for dealing successfully with cultural differences; - apply strategies to overcome problems related to intercultural differences; - work successfully in an English as a Lingua Franca environment; - cooperate effectively in intercultural teams to overcome and solve cultural problems and issues.
Course contents	<ul style="list-style-type: none"> - Attributes of a successful intercultural team participant/leader; - Hofstede's cultural dimensions; - Techniques for efficient communication in English as a Lingua Franca; - Strategies for working successfully in an intercultural team; - Problem based intercultural workshop
Prerequisites	B2 English level
Assessment Methods	<ul style="list-style-type: none"> - 25% student presentation - 50% successful completion of workshop - 25% final written task
Recommended Reading and Material	- Script
Attendance	75% mandatory
Comments	

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

Degree programme	ECI
Semester	2
Course methods	ILV
Language	English

ECTS Credits	3.00
Incoming places	Limited

Course description	<p>Firstly, this course prepares participants for their semester abroad by introducing them to critical aspects of cultural theory: stereotyping and its dangers, cultural self-awareness, the qualities and characteristics required in an international environment - and how to enhance them - and also Hofstede's cultural dimensions and how they should be approached and applied. Secondly, the course focuses on the specifics of a semester abroad, from the preparation that students will need to complete before they leave to how they might overcome culture specific challenges in their desired location. And finally, throughout the course, participants will be guided in their language and also their use of English as a Lingua Franca (ELF) to ensure the level of their language end of the course is a solid B2 and one that is fit for purpose in an ELF environment.</p>
Teaching methods	Theoretical input, group workshops, teamwork, group discussions, independent research, participant preparation of written documents.
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - 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.
Course contents	<ul style="list-style-type: none"> - 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) - Core B2 English language work
Prerequisites	B2 level English
Assessment Methods	<ul style="list-style-type: none"> - 50% student presentations - 25% completion of participation tasks

	- 25% final written task
Recommended Reading and Material	- Script
Attendance	75% mandatory
Comments	

BACHELOR DEGREE PROGRAMS

Business Informatics (BWI)

Distributed Systems

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

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

Assessment Methods	<ul style="list-style-type: none"> - Multimodal: - Theoretical assessment (Moodle MC test) - Homework (Coding Hand-Ins) - Project work
Recommended Reading and Material	- see Moodle
Attendance	mandatory
Comments	

IT-Based Controlling

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

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

Attendance	Mandatory
Comments	

Computer Science (BIF)

IT Project Work

Degree programme	BIF
Semester	2
Course methods	PRJ
Language	English
ECTS Credits	3.00
Incoming places	Limited

Course description	First experiences in practical IT project management are collected. Students work in small groups on specific projects. Projects are organized by the head of the course.
Teaching methods	project work
Learning outcome	After passing this course successfully students are able to ... <ul style="list-style-type: none"> - carry out supervised IT-projects in small groups - coordinate and plan programming work by themselves - apply the basic principles of project management in simple IT projects - work in teams and coordinate tasks - to create project documents by their own assessment
Course contents	<ul style="list-style-type: none"> - Working on semester projects and applying fundamentals of IT project management techniques - Structured approach to software projects - Selection of suitable development environments - Creation of basic project management documents - Collecting practical experience in group work
Prerequisites	none
Assessment Methods	- The completion of the project is being judged.
Recommended Reading and Material	<ul style="list-style-type: none"> - DeMarco, T., Martin, D., 2007. Der Termin: ein Roman über Projektmanagement, Nachdr. ed. Hanser, München. - Geirhos, M., 2015. IT-Projektmanagement: was wirklich funktioniert - und was nicht; 1. Aufl., 2., korrigierter Nachdr. ed, Galileo

	<p>computing. Galileo Press, Bonn.</p> <p>- Mangold, P., 2011. IT-Projektmanagement kompakt, 3., erw. Aufl., Nachdr. ed, kompakt-Reihe. Spektrum Akad. Verl, Heidelberg.</p> <p>- Tiemeyer, E., Bauer, N. (Eds.), 2014. Handbuch IT-Projektmanagement: Vorgehensmodelle, Managementinstrumente, Good Practices, 2., überarb. und erw. Aufl. ed. Hanser, München.</p>
Attendance	Partly
Comments	The supervision is done on an individual basis in synchronous or asynchronous settings and is supported by modern communication tools.

Business English

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

Course description	<p>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.</p>
Teaching methods	<p>small and medium tasks and activities; open class inputs and discussion; individual task completion settings; peer review and discussion</p>
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - 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
Course contents	<ul style="list-style-type: none"> - 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
Prerequisites	B2 level English
Assessment Methods	<ul style="list-style-type: none"> - 25% Business Impact Analysis Group Task - 25% Business Impact Analysis Language Task - 50% in-class writing
Recommended Reading and Material	- Murphy, R. (2019). English Grammar in Use, 5th Edition. Klett Verlag.
Attendance	Obligatory
Comments	

Computer Science Seminar

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

Course description	<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 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.</p>
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Teaching methods	integrated course
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - show and reflect the possibilities, range and limits of the application of eLearning. - reproduce the most important terms in eLearning. - describe which eDidactic methods can be used to implement it in an eCourse. - develop problems and feedback in an eLearning context. - use eLearning tools and feedback for content and application development. - design, implement and critically evaluate learning packages. - plan, implement and evaluate video trainings. - familiarize yourself with a new topic in computer science. - establish a connection between the new topics and practice.
Course contents	<ul style="list-style-type: none"> - Familiarization with a (new) topic and implementing a didactic e-learning concept in Moodle - Introduction eLearning & eDidactics - eLearning Tools & Moodle Basics - Icebreakers & Video Trainings - Video Trainings & Content Management - Learning Assessments - Finalisation Learning Package
Prerequisites	All courses of previous semesters User knowledge Moodle
Assessment Methods	<ul style="list-style-type: none"> - 20% eCourse Concept - 50% implementation - 10% CFF - 10% presentation - 10% Lerntagebuch
Recommended Reading and Material	- depending on chosen topic
Attendance	Attendance is required
Comments	-

Innovation Lab 2

Degree programme	BIF
Semester	4
Course methods	PRJ

Language	English
ECTS Credits	3.00
Incoming places	Limited

Course description	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.
Teaching methods	project work
Learning outcome	After passing this course successfully students are able to ... <ul style="list-style-type: none"> - Implement requirements in a team and transform them into an operational IT system - plan and coordinate a project in small groups - work in teams and to coordinate tasks - to present project results in front of colleagues and to argue possible solutions
Course contents	- Practical deepening of the content of other courses in a project
Prerequisites	All courses of previous semesters
Assessment Methods	- Project results
Recommended Reading and Material	- depending on project
Attendance	partly
Comments	The supervision is done on an individual basis in synchronous or asynchronous settings and is supported by modern communication tools.

Requirements Engineering

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

Course description	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, https://www.engineering.com/story/germanys-ghost-airport-berlins-brandenburg). 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.
Teaching methods	integrated course, flipped classroom principle
Learning outcome	After passing this course successfully students are able to ... <ul style="list-style-type: none"> - justify the need for requirements engineering - carry out requirements elicitation as appropriate - carry out requirements documentation correctly - correctly document requirements based on models - define and manage requirements in agile project settings - develop SW according to the BDD approach (Behavior-Driven-Development)
Course contents	<ul style="list-style-type: none"> - Requirements Engineering basics - Requirements documentation and modeling - Agile requirements engineering - User Story mapping - Behavior-Driven-Development
Prerequisites	none
Assessment Methods	<ul style="list-style-type: none"> - Knowledge tests - learning assignments - final exam
Recommended Reading and Material	- Requirements Engineering Fundamentals: A Study Guide for the Certified Professional for Requirements Engineering Exam Foundation Level – IREB compliant, 2nd Edition
Attendance	mandatory
Comments	Flipped Classroom Concept: preparatory literature study - assignments- 3 x 4h class-room units - final exam

Software Engineering 2 Labor

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

Course description	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.
Teaching methods	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.
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - implement a graphical user interface with the help of WPF or JavaFX - use a logging library to document and track runtime behavior of an application - create simple reports with tables and images using a PDF library - design and implement loosely coupled classes and interfaces - plan the deployment of an application and identify possible critical paths - use LINQ or Java Streams to implement functional programming concepts - consider SOLID principles during development of object-oriented software - detect, name and extend design patterns after Erich Gamma in object oriented software - reproduce visual modeling basics that include modeling goals and

	<p>the concepts of object orientation</p> <ul style="list-style-type: none"> - model class diagrams to visualize the classes of a software system and their relationships, as well as their behavior and properties - model sequence and communication diagrams to represent communication between classes
Course contents	<ul style="list-style-type: none"> - Introduction to application analysis and design - Design patterns - S.O.L.I.D. Principles - Basics of visual modeling (UML) - Class diagrams - Sequence and communication diagrams
Prerequisites	Knowledge for object-oriented development, database integration and integration of unit tests in C# or Java is required.
Assessment Methods	<ul style="list-style-type: none"> - Moodle Tests - Presentations - Semester project
Recommended Reading and Material	<ul style="list-style-type: none"> - C#: https://docs.microsoft.com/en-us/visualstudio/designers/getting-started-with-wpf - C#: http://han.technikum-wien.at/han/ebookcentral/ebookcentral.proquest.com/lib/ftw/detail.action?docID=5327214 - C#: https://www.syncfusion.com/succinctly-free-ebooks/wpf-succinctly - Java: https://openjfx.io/ - Java: https://link-1.springer-1com-1000342kv0273.han.technikum-wien.at/book/10.1007/978-3-658-02836-7 - Java: https://link-1.springer-1com-1000342we0744.han.technikum-wien.at/book/10.1007/978-3-658-30494-2 - Material (Slides, Videos, selected Articles) via Moodle
Attendance	mandatory
Comments	

Data Science und Machine Learning

Degree programme	BIF
Semester	4
Course methods	ILV
Language	English

ECTS Credits	5.00
Incoming places	Limited

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

Continuous Integration

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

Course description	<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 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.</p>
Teaching methods	Integrated course. Lectures, homework/project work, self-study with practical examples, and supervised project work.
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - apply the principles of semantic versioning to your own software projects - to set up a CI server - translate and test existing software on the CI server, build suitable packages and roll them out on the target system - understand the need to merge development and operations - to know the methods and processes of an optimized cooperation between development and operation
Course contents	<ul style="list-style-type: none"> - Semantic versioning and specialization in Git - Understand the motivation for CI - Set up and configure CI server (Jenkins) - Set up build jobs and build pipelines on the CI server - Use build tools (Ant, Maven, Gradle) - Set up and use other tools (Docker, SonarQube, Artifactory) - Application-release automation - Organizational and economic framework of DevOps

Prerequisites	Experience in software development, including project implementation. Basic experience in software testing. Basics of version control with Git.
Assessment Methods	<ul style="list-style-type: none"> - 2 x Moodle Multiple Choice Test (2 x 25%) - 1 x Semester Project (50%)
Recommended Reading and Material	<ul style="list-style-type: none"> - Ian Sommerville: Engineering Software Products. An introduction to modern software engineering (Pearson) - Humble, Farley: Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation
Attendance	mandatory
Comments	

Game Development Basics

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

Course description	This course gives an overview of topics related to game development as well as its challenges. It takes a look on all the things required to develop and publish a game on game consoles and tries to covers the larger area of technical implementation, game design, cooperation and communication within the team as well as some business and legal aspects.
Teaching methods	integrated course
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - To explain the structure of a commercial game production and to describe the process for releasing an indie game - Describe the basic functionality of modern game engines - to use the central functions and modules of Unity and to expand them with scripts - Load assets from external tools into the engine and process them there - To explain the basic processes of a Game AI or simple physical

	<p>facts and to implement them in Unity</p> <ul style="list-style-type: none"> - to design simple games, to create, implement and test the necessary software architecture - Implement acceleration techniques
Course contents	<ul style="list-style-type: none"> - Basic structure of a game - Distribution of roles and teamwork - Structure and framework of a commercial game production, economic and legal aspects - Game engine introduction and architecture - Unity basics - Game loop - Data Driven Development and Scripting - AI basics for games - Pathfinding - Collision detection
Prerequisites	Programming knowledge into gaming
Assessment Methods	<ul style="list-style-type: none"> - Code Reviews - Projects in small groups
Recommended Reading and Material	<ul style="list-style-type: none"> - Introduction to Game Design, Prototyping, and Development, Gibson Jeremy - ISBN: 0136619940 - The Art of Game Design: A Book of Lenses, Jesse Schell - ISBN: 1138632058 - A Theory of Fun for Game Design, Raph Koster - ISBN: 1932111972
Attendance	Yes
Comments	

Network Security

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

Course description	in this course you will learn security aspects in networks (technology
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	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.
Teaching methods	integrated course, flipped classroom principle
Learning outcome	After passing this course successfully students are able to ... <ul style="list-style-type: none"> - 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.
Course contents	<ul style="list-style-type: none"> - Physical Security - Secure Network Design - Secure Site Connections - IDS/IPS - Intrusion Detection & Prevention Systems - Secure Protocols (SSH, TLS, IPsec...) - 802.1x and Access Control - Authentication - DDOS mitigation
Prerequisites	Fundamentals of Computer ScienceIT Network fundamentalsOperating Systems Basics (Windows, Linux)
Assessment Methods	<ul style="list-style-type: none"> - Practical exercises - Final Exam (theory)
Recommended Reading and Material	<ul style="list-style-type: none"> - Cryptography and Network Security: Principles and Practice, Global 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)
Attendance	Mandatory.
Comments	

System Hardening

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

Course description	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).
Teaching methods	integrated course, flipped classroom principle
Learning outcome	After passing this course successfully students are able to ... <ul style="list-style-type: none"> - explain the need for secure systems, - identify basic methods for securing operating systems, - reflect different tasks of security measures of operating systems.
Course contents	<ul style="list-style-type: none"> - 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
Prerequisites	Basics of computer scienceBasics of IT infrastructureBasics of router and switching configuration
Assessment Methods	<ul style="list-style-type: none"> - Practical exercises - Final Exam (theory)
Recommended Reading and Material	<ul style="list-style-type: none"> - Mastering Linux Security and Hardening: Protect your Linux systems from intruders, malware attacks and other cyber threats, 2nd edition – Donald A. Tevault (2020) - 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) - Practical Linux Security Cookbook – Tajinder Kalsi (2018)

Attendance	Mandatory.
Comments	

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"> - develop advanced Android applications using the current development tools and IDEs - name and explain advanced design patterns and best practices for developing Android applications - structure and build your own Android application implementations according to these design patterns and best practices

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

Software Engineering 2 Labor

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

Course description	<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>
Teaching methods	<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>

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

	<ul style="list-style-type: none"> - Java: https://link-1springer-1com-1000342kv0273.han.technikum-wien.at/book/10.1007/978-3-658-02836-7 - Java: https://link-1springer-1com-1000342we0744.han.technikum-wien.at/book/10.1007/978-3-658-30494-2 - Material (Slides, Videos, selected Articles) via Moodle
Attendance	mandatory
Comments	

Information and Communication Systems and Services (BIC)

Business English

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

Course description	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.
Teaching methods	small and medium tasks and activities; open class inputs and discussion; individual task completion settings; peer review and discussion
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - 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
Course contents	- 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
Prerequisites	B2 level English
Assessment Methods	- 30% Business Impact Analysis Group Task - 30% Business Impact Analysis Language Task - 40% in-class writing
Recommended Reading and Material	- Murphy, R. (2019). English Grammar in Use, 5th Edition. Klett Verlag.
Attendance	Obligatory
Comments	None

IT Security Basics

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

Course description	The course offers an overview of the fundamentals of IT security and deals with cryptographic methods, authenticity, key management, access control and secure communication.
Teaching methods	
Learning outcome	After passing this course successfully students are able to ... - to name the protection goals of IT security and to show threats as well as methods to guarantee the goals - know cryptographic methods and can name their respective strengths and weaknesses and thus possible application scenarios - Encrypt and sign emails and any documents - List methods for access control and monitoring at network, system

	<p>and application levels and explain their function and application scenarios</p> <ul style="list-style-type: none"> - Can explain basic technologies for secure communication - Explain basic procedures for evaluating the importance of systems or for risk analysis
Course contents	<ul style="list-style-type: none"> - Basics of Information Security - Threat to IT security and sources of danger (internal and external threats) - Basics of cryptography - HMAC - Public key infrastructures (PKI) - Signatures - Certificates - access control - Identification/Authentication/Authorization - Password security/entropy - DMZ, Firewall & IDS/IPS - IPSec - Transport Layer Security - Secure communication mechanisms
Prerequisites	
Assessment Methods	
Recommended Reading and Material	
Attendance	
Comments	

Software Security

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

Course description	Software security is the umbrella term for software designed to
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	<p>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</p>
Teaching methods	
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - Establish identity & access management in (web) applications - Recognize the 10 most common security vulnerabilities in software - Use established authentication methods (HTTP Digest, Single Sign On/SAML/OAuth2) - Development of secure applications and assessment of current security risks - Evaluate software projects using a Secure Software Lifecycle - Assessment of threats to applications using a risk matrix - Basics for conducting a security assessment / pentest - Software development: Secure by design, secure by default
Course contents	<ul style="list-style-type: none"> - Application Security - Secure by design principles - Secure authentication in SW - Web Application Security - Identity & Access Management - Risikobewertung in SW / Threat Modeling - DB Security
Prerequisites	<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>
Assessment Methods	
Recommended Reading and Material	<ul style="list-style-type: none"> - SAML Specifications 2.1 - OAuth 2.0 Authorization Framework - RFC6749 - OWASP 10 2021++/-- - NIST Secure Software Development Framework - OWASP Secure Coding Guideline
Attendance	

Comments	
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Embedded Systems

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

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

Attendance	
Comments	

Electronics and Business (BEW)

Business English

Degree programme	BEW
Semester	2
Course methods	UE
Language	English
ECTS Credits	3.00
Incoming places	Limited

Course description	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.
Teaching methods	small and medium tasks and activities; open class inputs and discussion; individual task completion settings; peer review and discussion
Learning outcome	After passing this course successfully students are able to ... <ul style="list-style-type: none"> - 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
Course contents	<ul style="list-style-type: none"> - 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
Prerequisites	B2 level English
Assessment Methods	<ul style="list-style-type: none"> - 30% Business Impact Analysis Group Task - 30% Business Impact Analysis Language Task - 40% in-class writing
Recommended Reading and Material	- Murphy, R. (2019). English Grammar in Use, 5th Edition. Klett Verlag.
Attendance	Obligatory
Comments	

Computer Science 2

Degree programme	BEW
Semester	2
Course methods	FUV
Language	English
ECTS Credits	6.00
Incoming places	Limited

Course description	Advanced Programming in C
Teaching methods	Integrated course
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - explain and apply the concept of pointers and distinguish between pointers and arrays - use multidimensional arrays - utilize structs, unions, enumerations and typedefs - use header files and preprocessor directives - allocate memory dynamically - work with strings - implement simple algorithms and data structures
Course contents	<ul style="list-style-type: none"> - pointers and arrays - structs, unions, enumerations and typedefs - header files and preprocessor directives - dynamic memory management - strings - sorting algorithms

Prerequisites	basics of computer science and programming
Assessment Methods	- Course immanent assessment method
Recommended Reading and Material	- King, K.N. (2008):C Programming, Norton
Attendance	Compulsory attendance during on-campus phases
Comments	

Electronic Engineering 2

Degree programme	BEW
Semester	2
Course methods	FUV
Language	English
ECTS Credits	6.00
Incoming places	Limited

Course description	In the Electronic Engineering 2 course students acquire basic knowledge of fundamental rules in Electrical and Electronics Engineering of AC circuits and understand physical laws and abstractions applied to semiconductor devices.
Teaching methods	
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - apply the methods of complex alternating current technology (e.g. calculation with complex resistors and pointers as well as phasor diagrams) for calculating peaks of voltages and currents as well as phase shifts and to dimension the values of resistors, inductors and capacitors in AC circuits. - analyze and simulate a buck converter circuit. - design transistor circuits (transistor as switch, amplifier)
Course contents	<ul style="list-style-type: none"> - Inductor / Capacitor in DC / AC circuits - Complex alternating current calculus - Filter Circuits (low-pass, high-pass, band-pass) - Resonance circuits - Power - Phasor diagram - Diode, rectifier - Transistor, Mosfet

	- DC-DC Converter, transformer
Prerequisites	Electronic Engineering 1
Assessment Methods	- Course immanent assessment method and end exam
Recommended Reading and Material	<ul style="list-style-type: none"> - Maxfield and others (2008): Electrical Engineering – know it all, Newnes Verlag - Seidel, Heinz-Ulrich (2003): Allgemeine Elektrotechnik: Gleichstrom Felder – Wechselstrom, Hanser Verlag - Weißgerber, Wilfried (2013): Gleichstromtechnik und Elektromagnetisches Feld. Ein Lehrund Arbeitsbuch für das Grundstudium, Springer Fachmedien Wiesbaden Verlag - Bieneck, Wolfgang (2014): Grundlagen der Elektrotechnik ; Informationsund Arbeitsbuch für Schüler und Studenten der elektrotechnischen Berufe, Holland und Josenhans Verlag
Attendance	compulsory attendance during on-campus phases
Comments	

Electronic Measurement & Control Engineering

Degree programme	BEW
Semester	2
Course methods	FUV
Language	English
ECTS Credits	6.00
Incoming places	Limited

Course description	The course Electronic Measurement and Control Systems presents the fundamentals of Control Theory like Open Loop, Closed Loop model, calculation of step response and transfer function, Analysis of stability under consideration of different controllers like PID. The issue of gain – and phase margin and the digital controller are also the topics auf this course.
Teaching methods	
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - explain basic terms such as Open Loop, Closed Loop model, Stability, gain-and phase margin, P,I and D Controller. - apply calculation method of step response and transfer function. - calculating gain-and phase margin of Control circuit

	- design a digital controller
Course contents	<ul style="list-style-type: none"> - Basic principles of Control Circuits - Laplace Transformation - Plants and Controller (P,I and D Controller) - Step Response - Transfer Function - Stability - Control Deviation - Gain and phase margin - Digitalization of the Control process
Prerequisites	Successful completion of the courses of the first semester
Assessment Methods	- Assessment in writing, theory and calculations.
Recommended Reading and Material	<ul style="list-style-type: none"> - Distance learning materials: - Scripts - Videos - Books: - Electrical Engineering-know it all. - Haager: Regelungstechnik öbv - Matlab
Attendance	compulsory attendance during on-campus phases
Comments	

Laboratory 2

Degree programme	BEW
Semester	2
Course methods	LAB
Language	English
ECTS Credits	3.00
Incoming places	Limited

Course description	Design and experimental set-up of electronic circuits and circuits, as well as their validation and characterization with modern measuring instruments.
Teaching methods	
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - design and experimental set-up basic electronic circuits and validate and characterize them with modern measuring instruments.

	<ul style="list-style-type: none"> - measure and interpret voltage and current in circuits with inductor, capacitor, transistor, resistor and diode with an oscilloscope. - simulate and design a buck converter circuit.
Course contents	<ul style="list-style-type: none"> - Safety regulations, laboratory rules, technical reports - ADC-DAC Voltage - Bridge circuits - Switching of an inductive load - Electronic measurement and control engineering circuits - Buck converter
Prerequisites	Electronic Engineering 1, Electronic Design 1
Assessment Methods	<ul style="list-style-type: none"> - Course immanent assessment method - Laboratory notes - Laboratory reports - Grading of practical session - Laboratory reports
Recommended Reading and Material	<ul style="list-style-type: none"> - Maxfield and others (2008): Electrical Engineering – know it all, Newnes Verlag - Seidel, Heinz-Ulrich (2003): Allgemeine Elektrotechnik: Gleichstrom Felder – Wechselstrom, Hanser Verlag - Weißgerber, Wilfried (2013): Gleichstromtechnik und Elektromagnetisches Feld. Ein Lehrund Arbeitsbuch für das Grundstudium, Springer Fachmedien Wiesbaden Verlag - Bieneck, Wolfgang (2014): Grundlagen der Elektrotechnik ; Informationsund Arbeitsbuch für Schüler und Studenten der elektrotechnischen Berufe, Holland und Josenhans Verlag
Attendance	compulsory attendance during on-campus phases
Comments	

Team Work

Degree programme	BEW
Semester	2
Course methods	FUV
Language	English
ECTS Credits	1.50
Incoming places	Limited

Course description	The course prepares students for team work in their studies and in their professional work
Teaching methods	
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - explain models of team development (for example Tuckman) and to derive interventions for their own practice - explain team roles (for example Belbin) and to identify them in simple practical examples - use constructive feedback in team conflicts
Course contents	<ul style="list-style-type: none"> - Characteristics and criterias of success in teamwork - Team development - Team roles - Structure of personalities in team processes - Preferred team roles and personal potential for development - Constructive feedback in conflicts
Prerequisites	none
Assessment Methods	- Course immanent assessment method
Recommended Reading and Material	<ul style="list-style-type: none"> - Belbin, M. R. (1999): Team Roles at Work, Oxford: Butterworth & Heinemann - Harvard Business Essentials (2004): Creating Teams with an Edge. The Complete Skill Set to Build Powerful and Influential Teams, Boston: Harvard Business School Publishing Corporation - Maginn, M. (2004): Making Teams Work: 24 Lessons for Working Together Successfully, Dubuque: McGraw-Hill Professional Education Series
Attendance	Distance learning
Comments	none

Technical and Creative Communication

Degree programme	BEW
Semester	2
Course methods	SE
Language	English
ECTS Credits	1.50
Incoming places	Limited

Course description	Starting from the Common European Framework of Reference for Languages B2, we aim at developing and strengthening the vocabulary of the students' field of study along with the language skills required for technical and creative communication
Teaching methods	
Learning outcome	After passing this course successfully students are able to ... - structure and describe a technical process in English for a given target group; - illustrate and explain abstract technical concepts through real-life examples; - distinguish and implement the basic formal and language-related features of technical communication.
Course contents	<ul style="list-style-type: none"> - audience adaptation in terms of language and content - impact analysis - technical process descriptions - elements of technical communication - technology and creativity
Prerequisites	Common European Framework of Reference for Languages Level B2 Completion of previous semester course
Assessment Methods	- Course immanent assessment method, i.e. active participation in online activities and timely completion of assignments
Recommended Reading and Material	<ul style="list-style-type: none"> - Schökler, G. (2015): Einzelskripten, adapted from Maderdonner, O. / et al (2014): Technical and Creative Communication, Skriptum - Connolly, P. / Kingsbury, P. et al. (2014): eSNACK, Lernplattform - Additional current handouts and audio-visual support
Attendance	Compulsory attendance during on-campus phases
Comments	

Mathematics 2

Degree programme	BEW
Semester	2
Course methods	FUV
Language	English
ECTS Credits	3.00
Incoming places	Limited

Course description	Advanced topics in engineering mathematics focussing on signal analysis and differential equations
Teaching methods	
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - decompose vectors into orthogonal components - expand a given periodic function into its Fourier series (in real and complex form) - determine Fourier and Laplace transforms of functions using tables and transformation rules (shift theorems, scaling properties) - solve simple ordinary differential equations and initial value problems using appropriate methods
Course contents	<ul style="list-style-type: none"> - Vectors and vector spaces, bases - Scalar products and orthogonality - Fourier series - Fourier transform - Laplace transform - Overview of types of differential equations - Solution methods for simple (in particular linear) ordinary differential equations and corresponding initial value Problems - Solving initial value problems for linear differential equations with constant coefficients using the Laplace transform
Prerequisites	Mathematics 1
Assessment Methods	- Written tests at midterm and end of semester
Recommended Reading and Material	<ul style="list-style-type: none"> - Papula, L. (2015): Mathematik für Ingenieure und Naturwissenschaftler Band 2, Springer Vieweg - Stingl, P. (2009): Mathematik für Fachhochschulen: Technik und Informatik, Hanser - Sturm, Th. F. (2007): Mathematik für Ingenieure 3 - Timischl, W. / Kaiser, G.: Ingenieur-Mathematik 4, E. Dorner
Attendance	compulsory attendance during on-campus phases
Comments	

Physics 1

Degree programme	BEW
Semester	2
Course methods	FUV
Language	English

ECTS Credits	3.00
Incoming places	Limited

Course description	The lecture focuses on the transfer of basic knowledge on mechanics and thermodynamics and electrodynamics. It is the goal to enable students to describe technical processes by means of scientific methods. Thereby an understanding of physical and scientific modelling is generated. By applying physical laws to simple technical problems the meaning of physical laws is explained.
Teaching methods	
Learning outcome	After passing this course successfully students are able to ... - find out the relevant physical laws for a given technical problem and apply the laws to solve the Problem - give a physical explanation for simple processes and deduce a mathematical formulation - deduce mathematical equations based on technical Problems - transfer technical problems in a mathematical form so that calculations can be done - analyze the results of a calculation with respect to the technical consequences and give clear advice for implementation
Course contents	<ul style="list-style-type: none"> - Mechanics - Oscillations and waves - Thermodynamics - Electrodynamics
Prerequisites	Basic mathematical knowledge.
Assessment Methods	- Course immanent assessment method and end exam
Recommended Reading and Material	<ul style="list-style-type: none"> - Horst Kuchling (2004): „Taschenbuch der Physik“, Carl Hanser Verlag - Halliday, Resnick, Walker (2003): „Physik“, Wiley-VCH
Attendance	compulsory attendance during on-campus phases
Comments	

Electronic Project 2

Degree programme	BEW
Semester	4
Course methods	FUV

Language	English
ECTS Credits	6.00
Incoming places	Limited

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

Business Communication for Engineers

Degree programme	BEW
Semester	4
Course methods	SE

Language	English
ECTS Credits	1.50
Incoming places	Limited

Course description	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
Teaching methods	
Learning outcome	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
Course contents	- Economic concepts and theories - Winners and losers of globalization - Development of technologies - Innovation
Prerequisites	Completion of previous course
Assessment Methods	- Course immanent assessment method, i.e. active participation in class activities and timely completion of assignments
Recommended Reading and Material	- Maderdonner, O. / et al (2014): Economy, Technology and Society, Skriptum - Additional current handouts and audio-visual support
Attendance	compulsory attendance during on-campus phases
Comments	

Communication Technologies

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

Course description	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
Teaching methods	
Learning outcome	After passing this course successfully students are able to ... <ul style="list-style-type: none"> - outline and compare different mobile network architectures - explain mobile radio interfaces and to list their characteristics - describe different mobile network use cases - calculate characteristics of information sources (e.g. information content, entropy) - design a binary coding with minimum average code word length for information sources - apply linear block codes to detect and correct errors
Course contents	<ul style="list-style-type: none"> - Radio interface, network architecture and functionalities in 2nd generation of mobile networks (GSM and GPRS) - Radio interface, network architecture and functionalities in 3rd generation of mobile networks (UMTS) - Radio interface, network architecture and functionalities in 4th generation of the mobile networks (LTE) - Principles of information theory (information content, entropy, Markov sources) - Entropy coding (Huffman and Arithmetic Coding) - Pre-Coding (run length encoding, quadtree coding) - Encoding and decoding with linear block codes (generator matrix, parity check matrix, syndrome) - Receiver strategies and channel capacity
Prerequisites	To successfully pass the course, students must have basic mathematical knowledge in:- statistics- linear algebra
Assessment Methods	- Course immanent assessment method (regular homeworks) and end exam
Recommended Reading and Material	<ul style="list-style-type: none"> - J. G. Proakis, M. Salehi, Digital Communications, Fifth Edition, McGraw-Hill, New York, 2008 - J. Schiller, Mobile Communications, Second Edition, Pearson

	<p>Education Limited, 2003</p> <ul style="list-style-type: none"> - B. Walke, Mobilfunknetze und ihre Protokolle, Band 1 und 2, B. G. Teubner, Stuttgart, 1998. - B. Walke, M. P. Althoff, P. Seidenberg, UMTS –Ein Kurs, J.SchlembachFachverlag, 2001
Attendance	compulsory attendance during on-campus phases
Comments	

Computer Science 4

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

Course description	Computer science
Teaching methods	Distance Learning
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - - simulate execution of object-oriented Java programs with pen and paper and predict behaviour and output for given input. - - implement entity classes with several class invariants in Java. - - analyse requirements based on class diagrams and javadocs and implement those requirements - - re-implement behaviour of concrete super-classes in concrete (sub-) classes. - - use classes in object oriented Java applications - - implement a sortable and searchable linked list of several types of persons. - - export and import data to/from text-files with streams and correct exception handling. - - implement a console-based, text-menu-driven application with extendable display options using a searchable, sortable custom container that supports file import/export.
Course contents	<ul style="list-style-type: none"> - - Object Oriented Programming (Classes, Objects, Reference, Inheritance, Polymorphism, Interfaces, inner classes) - - Exceptions and Exception handling

	- - Introduction to JAVA Collection Framework (Core Collection Interfaces, Iterators, ArrayList, LinkedList)
Prerequisites	Computer Science 1-3
Assessment Methods	- - extra credit for continuous submission - final project - final test (PC-based)
Recommended Reading and Material	<ul style="list-style-type: none"> - - David J. Eck: Introduction to Programming using Java. (several versions, free!) [http://math.hws.edu/javanotes/] - - Bert Bates, Kathy Sierra: Head First Java. 2003, O'Reilly Media (ISBN: 978-0-596-00465-1) other - - Bruce eckel: Thinking in Java. several editions, some freely available. [http://www.mindview.net/Books/TIJ/] - - Joshua Bloch: Effective Java: A Programming Language Guide. 2008 Addison-Wesley Longmann. (ISBN: 978-0321356680) - - Joshua Bloch, Neal Gafter: Java Puzzlers: Traps, Pitfalls, and Corner Cases. 2005, Addison-Wesley Longmann. (ISBN: 978-0321336781) - - tutorials and additional information on java webpage [http://www.oracle.com/technetwork/java/index.html]
Attendance	kickoff and final test mandatory
Comments	-

Moderation & Problem Solving Techniques

Degree programme	BEW
Semester	4
Course methods	FUV
Language	English
ECTS Credits	1.50
Incoming places	Limited

Course description	The course prepares the students for the role of a facilitator using relevant methods of problem solving and supporting creativity.
Teaching methods	
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - 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.
Course contents	<ul style="list-style-type: none"> - Objectives and roles (eg. moderator, keep a log) of moderation - Expiration of a moderation - Brainstorming and creativity techniques - Analysis and Decision-Making-Techniques "
Prerequisites	none
Assessment Methods	- Course immanent assessment method
Recommended Reading and Material	- Pocket Mentor Series (2008): Making decisions, Boston, Harvard Business School Press
Attendance	compulsory attendance during on-campus phases
Comments	none

Business Administration 2

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

Course description	The course gives an introduction in the area of business administration, with special focus on cost accounting, budgeting and capital investment.
Teaching methods	Distance Learning, Assignments, Videos, Group Work
Learning outcome	After passing this course successfully students are able to ... <ul style="list-style-type: none"> - 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.
Course contents	<ul style="list-style-type: none"> - management accounting - capital budgeting

	<ul style="list-style-type: none"> - budgeting - direct and indirect costs
Prerequisites	Business Administration 1
Assessment Methods	- course immanent assessment + final written exam
Recommended Reading and Material	- John R. Dyson, Accounting for non-accounting students, eight edition, Pearson
Attendance	Attendance is compulsory during on-Campus phases
Comments	

Physics 3

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

Course description	Course mainly focuses physical problems solveable by ODEs: for example: growth phenomena and oscillations. Prospects to wave phenomena and transport phenomena as thermal conductivity effects.
Teaching methods	Blended learning with MoodlePrivate study of well defined tasksIndividual written elaboration and collegiate review
Learning outcome	After passing this course successfully students are able to ... <ul style="list-style-type: none"> - Description of physical problemsMathematical solution and interpretation of resultsHow to use specific literature
Course contents	<ul style="list-style-type: none"> - ElectricityMagnetismGrowth EffectsOscillationProspects to wave phenomena and transport phenomena as thermal conductivity effectsUncertainty in Measurement Results
Prerequisites	Elementary physics and mathematics
Assessment Methods	- Individual written elaborationCollegiate reviewExamination
Recommended Reading and Material	- Gerthsen: PhysikTipler: PhysikModul ScriptsWeb
Attendance	

Comments	
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Advanced Communication

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

Course description	The students acquire writing and speaking skills necessary to complete their bachelor studies, such as writing abstracts and techniques for successful presentations
Teaching methods	
Learning outcome	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
Course contents	<ul style="list-style-type: none"> - Structure of an abstract vs. German summary - Writing process - Building an English presentation from a German paper - Presentation techniques and relevant language
Prerequisites	Common European Framework of Reference for Languages Level B2 Completion of previous semester course
Assessment Methods	- Course immanent assessment method, i.e. active participation in class activities and timely completion of assignments
Recommended Reading and Material	<ul style="list-style-type: none"> - Maderdonner, O. / et al (2014): Abstract Writing, Skriptum - Maderdonner, O. / et al (2014): Presentation Essentials, Skriptum - Additional current handouts and audio-visual support
Attendance	compulsory attendance during on-campus phases
Comments	

Business Law

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

Course description	Imparting knowledge of selected legal topics regarding the international economic law
Teaching methods	*) Presentations and examples for self assessment *) Case studies as examples and for self study *) Scripts for self study
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - 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
Course contents	<ul style="list-style-type: none"> - 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
Prerequisites	None
Assessment Methods	- Assignments (50%) and Exam (50%), but at least 1% from each part
Recommended Reading and Material	- Scripts and materials (audio-visual presentations, etc.) available in the downloadarea of moodle
Attendance	compulsory attendance during on-campus-phases
Comments	

Change Management

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

Course description	The course Change Management prepares the students for contact with change processes from a systemic view.
Teaching methods	
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - identify phases (for example by B. Conner) and dynamics (symptoms, causes) of resistance using simple examples and explain. - 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. - explain methods of integration of employees (for example kick-off workshop , interview) and to explain consequences of participation / non-participation.
Course contents	<ul style="list-style-type: none"> - Guidelines and models for change processes - Context clarification - Handling of resistance - Systemic Thinking - Methods of employee participation
Prerequisites	none
Assessment Methods	- Course immanent assessment method (participated successfully)
Recommended Reading and Material	<ul style="list-style-type: none"> - Conner, Daryl R. (2006): Managing at the speed of change, Verlag Randome House, NY - Key Literature of the course: Managing at the Speed of Change: How Resilient Managers Succeed and Prosper Where Others Fail, New York, 2006. - Spencer Johnson, Who moved my Cheese. An Amazing Way to Deal with Change in your Work and in your Life, New York 1998 - Jeannene LaMarsh, Changing the Way We Change. Gaining Control of Major Operational Change, 1995 - Harvey Robbins, Michael Finley, Why Change doesn't Work. Why Initiatives go Wrong and how to Try Again - and Succeed, 199 - Managing Change and Transition. Practical Strategies to Help You

	Lead During Turbulent Times (Harvard Business Essential Series), 2003
Attendance	compulsory attendance during on-campus phases
Comments	none

Technology Management

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

Course description	Technology Management
Teaching methods	Lecture, Self Studies, Elaborations on set topics, Preparation of a seminar paper on an individually agreed case.
Learning outcome	After passing this course successfully students are able to ... - explain typical challenges in Innovation- and Technology Management. - apply simple tools for organizing Innovation and Technology Management projects.
Course contents	<ul style="list-style-type: none"> - Differentiation: Technology Management - Innovation Management - Importance of Technology and Innovation Management for enterprises and organizations. - Spotting opportunities for Technology and Innovation Management - Designing plans for Technology and Innovation Management activities.
Prerequisites	According to the position of the course in the Program's Curriculum
Assessment Methods	<ul style="list-style-type: none"> - Assignments - Presentation - Final written exam
Recommended Reading and Material	- 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
Attendance	Compulsory

Comments	
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Electronic Engineering (BEL)

Business English

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

Course description	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.
Teaching methods	small and medium tasks and activities; open class inputs and discussion; individual task completion settings; peer review and discussion
Learning outcome	After passing this course successfully students are able to ... <ul style="list-style-type: none"> - 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
Course contents	<ul style="list-style-type: none"> - 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

Prerequisites	B2 level English
Assessment Methods	<ul style="list-style-type: none"> - 30% Business Impact Analysis Group Task - 30% Business Impact Analysis Language Task - 40% in-class writing
Recommended Reading and Material	- Murphy, R. (2019). English Grammar in Use, 5th Edition. Klett Verlag.
Attendance	Obligatory
Comments	

Chip Design 1

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

Course description	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.
Teaching methods	
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - model simple digital circuits and systems consisting of combinatorial and sequential logic with the hardware description language VHDL by applying coding guidelines - verify the proper functionality of these systems by using an industrial logic simulator - synthesize & implement these systems on FPGA devices by using industrial tools
Course contents	<ul style="list-style-type: none"> - Introduction to the hardware description language VHDL - Modeling of combinatorial and sequential logic by using VHDL - VHDL coding guidelines - Verification of digital circuits and systems by using an industrial logic simulator - Synthesis and implementation of digital circuits and systems on

	FPGA devices as target technology by using industrial tools - Project
Prerequisites	Digital Systems & Computer Architecture
Assessment Methods	
Recommended Reading and Material	
Attendance	mandatory
Comments	none

Embedded Systems

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

Course description	This class deals with the development and implementation of elaborate software projects, based on Embedded Systems and corresponding communication modules.
Teaching methods	impulse lectures, programming labs using hands-on trainings
Learning outcome	After passing this course successfully students are able to ... - Implement sophisticated communication modules of Embedded Systems (Bluetooth, Wifi, ZigBee, Ethernet, USB, ...) - Utilize existing communication module stacks/software libraries - Record and analyze communication protocols - Implement assignments either based on stand-alone firmware or based on pre-configured Embedded OSs (e.g. Embedded Linux)
Course contents	- Description of basic concepts for embedded operating systems (e.g. Embedded Linux) - Implementation and description of various sophisticated embedded communication interfaces (e.g. USB, Bluetooth, Wifi, Ethernet, ZigBee, ...) - Implementation of one or more assignments based on embedded hardware platforms (utilizing existing embedded libraries) - Recording and analyzation of data transfers of the embedded

	communication interfaces, in order to understand the dataflow and the debugger - Implementation of a project based on the course contents - Embedded Systems Operating Systems
Prerequisites	Programming, Microcontroller
Assessment Methods	- Test, Assessment of task and project submissions
Recommended Reading and Material	
Attendance	mandatory
Comments	none

Mechanical Engineering (BMB)

Business English

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

Course description	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.
Teaching methods	small and medium tasks and activities; open class inputs and discussion; individual task completion settings; peer review and discussion
Learning outcome	After passing this course successfully students are able to ... - record and employ vocabulary for business in technology

	<ul style="list-style-type: none"> - 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
Course contents	<ul style="list-style-type: none"> - 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
Prerequisites	B2 level English
Assessment Methods	<ul style="list-style-type: none"> - 25% Business Impact Analysis Group Task - 25% Business Impact Analysis Language Task - 50% in-class writing
Recommended Reading and Material	- Murphy, R. (2019). English Grammar in Use, 5th Edition. Klett Verlag.
Attendance	75%
Comments	none

Mechatronics/Robotics (BMR)

Materials Science

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

Course description	In this course, students acquire the fundamentals of metallic materials
Teaching methods	Integrated course
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - be able to name material properties. - be able to explain the basic properties of metallic materials (steel,

	<p>cast iron, aluminium, copper, titanium, magnesium and their alloys) from a scientific and technical point of view and by means of practical industrial examples.</p> <ul style="list-style-type: none"> - - explain the principles of microscopy and electron microscopy. - - be able to make a simple material selection of metals. - - be able to name metallic materials. - - be able to list metallic materials in comparison to plastics and ceramics as well as composite materials with advantages and disadvantages. - - be able to explain the basics of mechanical methods for testing materials as well as selected concrete test methods using appropriate technical terms and quantities (tensile test, hardness test, Charpy, Wöhler).
Course contents	<ul style="list-style-type: none"> - - Terms (e.g. thermal expansion, modulus of elasticity, ...) and material properties - - Atomic decomposition & periodic table, chemical bonds - - Structure of metals (krz, kfz, hdp) - - Iron-carbon diagram - - Steel and cast iron - - Aluminium materials - - Copper Materials - - Titanium materials - - Magnesium materials - - Alloys, state diagrams - - Electrochemistry especially corrosion of metallic materials - - Mechanical test methods (tensile test, notched bar impact bending test, hardness test, Wöhler test), PT, MT, VT; UT. - - Effects of mechanical stress (e.g. deformation, work hardening) - - Interaction of material and production technology, example forging - - Basic principles of material selection (presentation of software tools) - - Differences between the material classes (metals, plastics, ceramics) - - Electron microscopic examination of various materials
Prerequisites	Basic knowledge according to admission requirements for the bachelor's program
Assessment Methods	- Participation and presentation, Moodle tests and final examination
Recommended Reading and Material	- - Ashby, M.F.; Jones, D.R.H.: Engineering Materials 1: An Introduction to Properties, Applications and Design, Elsevier, 2011
Attendance	75%

Comments	none
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Manufacturing Engineering

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

Course description	In this course students acquire basic knowledge in the fields of production engineering according to DIN 8580
Teaching methods	Integrated course
Learning outcome	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)
Course contents	- - Requirements for industrial manufacturing processes (incl. measured variables) - - Overview of main groups of manufacturing processes (DIN8580)
Prerequisites	Basic knowledge according to admission requirements for the bachelor's program
Assessment Methods	- Participation, Moodle tests and final examination
Recommended Reading and Material	- - Förster, R.; Förster, A.: Einführung in die Fertigungstechnik, Springer Vieweg, 2018
Attendance	75%
Comments	none

Biomedical Engineering (BBE)

Business English

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

Course description	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.
Teaching methods	small and medium tasks and activities; open class inputs and discussion; individual task completion settings; peer review and discussion
Learning outcome	After passing this course successfully students are able to ... <ul style="list-style-type: none"> - 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
Course contents	<ul style="list-style-type: none"> - 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
Prerequisites	B2 level English
Assessment Methods	<ul style="list-style-type: none"> - 30% Business Impact Analysis Group Task - 30% Business Impact Analysis Language Task - 40% in-class writing

Recommended Reading and Material	- Murphy, R. (2019). English Grammar in Use, 5th Edition. Klett Verlag.
Attendance	75 %
Comments	

Basics of Prosthetics

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

Course description	Introduction to the basic principles of protection
Teaching methods	
Learning outcome	After passing this course successfully students are able to ... - to name the causes and level of amputation. - Describe different fitting options. - To select materials for prostheses and orthoses. - Orthopaedic products and their specifications for describe.
Course contents	- Causes of amputation - Representation of the supply process - Amputation level - Materials in orthopaedic technology - Mechanics and biomechanics in orthopaedic technology - Supply options related to Amputation level - Shaft connection
Prerequisites	
Assessment Methods	
Recommended Reading and Material	
Attendance	
Comments	

Molecular Genetics

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

Course description	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.
Teaching methods	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.
Learning outcome	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
Course contents	<ul style="list-style-type: none"> - Introduction and basics of molecular genetics - Cell cycle and mitosis/replication - Sexual reproduction and meiosis/recombination - Transcription - Translation - Genetics of bacteria - gene regulation
Prerequisites	ILV Biochemie und Molekularbiologie (BIOMO)
Assessment Methods	- written final exam (80% of final grade), groupworks in class (20% of final grade)
Recommended Reading and Material	<ul style="list-style-type: none"> - Molekulare Genetik - Rolf Knippers, Thieme Verlag - Genetik - Allgemeine Genetik - Molekulare Genetik - Entwicklungs-genetik - Wilfried Janning; Elisabeth Knust, Thieme

	Verlag
Attendance	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	

Computational Bioanalysis

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

Course description	Fundamentals of computational bioanalysis
Teaching methods	
Learning outcome	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.
Course contents	- Literature databases - Sequence comparisons (BLAST) on protein and DNA level - Protein Prediction Tools - protein structures - Gene Enrichment Analysis, gene expression data sets
Prerequisites	
Assessment Methods	
Recommended Reading and Material	
Attendance	
Comments	

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	

Telemedicine & eHealth

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

Course description	Introduction to telemedicine and eHealth
Teaching methods	

Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - to classify existing systems or systems planned for the future according to different classification systems. - 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. - understand the concept and the different levels of interoperability in the health care system and explain which standards can be used at which level. - Relate and balance the benefits and risks of healthcare ICT applications.
Course contents	<ul style="list-style-type: none"> - Introduction and definition of terms: eHealth, mHealth, pHealth, telemedicine - Healthcare challenges and eHealth solutions - Basic technologies (networks, mobile and wireless) - Legal and health policy General conditions - Interoperability and standards - The Electronic Health Record / ELGA - Patient-centred care (home, health and telemonitoring) - Information and communication technology in the biomedical research - Future aspects and resources for a deepening of the Field of expertise
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
Course description	Introduction to technology and definition of heart, lung and circulation technology
Teaching methods	
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - select suitable methods for measuring pressure and flow in the lungs and circulation for given issues and justify this selection. - compare different methods for ECG acquisition and detect and eliminate signal interference. - to describe the essential components of pacemakers and to name and justify the settings for different heart diseases. - to describe the sequence of spirometric and oxymetric examinations and to discuss the possibilities and limitations of measurement methods used. - to name the essential aspects for the electrical safety of a given measurement setup and to identify problems. - to perform simple risk analyses of devices for circulatory and pulmonary medicine.
Course contents	<ul style="list-style-type: none"> - Fundamentals of fluid mechanics with regard to the flows in the circulation and lungs - Pressure measuring method: Invasive, non-invasive - Flux measurement method: Invasive, non-invasive - ECG: Conclusion, most important pathophysiological Phenomena, derivations, basic circuits - Spirometry, oximetry - Cardiac pacemakers: basics, components, Operating modes - Safety technology in devices and installation with specific aspects of cardiac safety - Applied risk analysis for cardiovascular devices Lung Medicine
Prerequisites	
Assessment Methods	
Recommended Reading and Material	
Attendance	
Comments	

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	

Safety & Communications in Medical Data Engineering

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

Course description	Principles and methods of software development and software testing
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Teaching methods	
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - 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.
Course contents	<ul style="list-style-type: none"> - fundamental test process - V-model - Standards for medical software development - Standards for medical software development - Basics of data communication - IDE Features (Debugging, Unit Tests, ...)
Prerequisites	
Assessment Methods	
Recommended Reading and Material	
Attendance	
Comments	

Medical Data Engineering 1

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

Course description	Inter-semester project (together with the course "Medical Data Engineering 2)
Teaching methods	
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - to design software for the health care system which could be used by service facilities of the Health Information Network (GIN, Austrian

	<p>eCard System, electronic insurance card).</p> <ul style="list-style-type: none"> - 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 - Design database applications for the health care sector and perform simple database transactions. - to apply the basic rules of scientific work when writing and analysing texts, distinguishing a scientific approach from a non-scientific (everyday) one
Course contents	<ul style="list-style-type: none"> - Health Information Network (GIN) - Software development for the health sector - Structured data in the health sector
Prerequisites	
Assessment Methods	
Recommended Reading and Material	
Attendance	
Comments	

Immunology

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

Course description	Introduction to Immunology
Teaching methods	Self-study and Team work in class, student-centered learning, presentations of the group works
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - explain basic relationships of immunological interactions. - classify the innate and adaptive immune system. - theoretically distinguish bacterial and viral infections. - explain basic mechanisms of allergies and autoimmune diseases - explain the principle and challenges of transplantation.

Course contents	<ul style="list-style-type: none"> - lymphoid organs and their function - innate and adaptive immune system - viral and bacterial infection - inflammation reactions - allergy, autoimmune diseases, transplantation
Prerequisites	Knowledge from ANAT, CCT and INSTR about cells and antibodies
Assessment Methods	- 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)
Recommended Reading and Material	- K. Murphy and C. Weaver, "Janeway's Immunobiology," 9th Edition, New York, NY, Garland Science/Taylor & Francis, 2017
Attendance	75% attendance is compulsory.
Comments	

Cancer Drugs & Therapies

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

Course description	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.
Teaching methods	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.
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - Outline the development of tumors on a molecular and cellular level and enumerate the characteristics of tumors described by Hanahan and Weinberg. - Propose solutions based on bioassays for questions in the field of

	<p>tumor biology.</p> <ul style="list-style-type: none"> - Describe common in vitro and in vivo tumor models and to explain possible applications using examples. - Explain the categories of pharmacokinetics and essential parameters of pharmacodynamics and outline the essential steps to the production of pharmaceuticals. - Perform simple calculations with pharmacokinetic parameters (e.g. bioavailability, volume of distribution, clearance). - Distinguish between acute and chronic toxicity, explain different types of toxic responses and dose-response curves, and give examples of different types of toxins. - Compare traditional chemotherapy, gene therapy and cell-based treatment options in oncology and to explain the underlying molecular mechanisms of action using selected examples.
Course contents	<ul style="list-style-type: none"> - Tumor assays - Tumor models - Pharmacokinetics and pharmacodynamics - Toxicology - Traditional cancer drugs - Gene- and cell-based therapies
Prerequisites	Biochemie und MolekularbiologieCell Culture Techniques
Assessment Methods	- Entrance tests, Group work, Final Exam
Recommended Reading and Material	- Kleinsmith: Principles of Cancer Biology, 2014, Pearson
Attendance	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	

Embedded Systems in Medicine

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

Course description	Introduction and subsequent project work in the field of "Embedded Systems"
Teaching methods	
Learning outcome	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
Course contents	- project work
Prerequisites	
Assessment Methods	
Recommended Reading and Material	
Attendance	
Comments	

Circuit Design & Signal Analysis

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

Course description	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
Teaching methods	
Learning outcome	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.

Course contents	<ul style="list-style-type: none"> - passive electronic components - AC and DC analysis of linear network - Complex signal analysis - ESD protection in the biomedical field - Operational amplifier circuits: Amplifier and Filter circuits - Instrumentation amplifier for bioelectric - Single and dual voltage supplies for analogue/digital circuits - Guidelines for verification of electronic Circuits - Design and evaluation of a biosignal amplifier
Prerequisites	
Assessment Methods	
Recommended Reading and Material	
Attendance	
Comments	

Biomechanics and Ergonomics Laboratory

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

Course description	<p>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.</p>
Teaching methods	
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - Use different methods to assess human motion (force plate, plantar pressure measurement, 2D video analysis) - Explain changes in ground reaction forces due to different walking

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

Cell Culture Laboratory

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

Course description	Learning the most important methods and proper use of the equipment used in cell culture
Teaching methods	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
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - 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. - 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. - Prepare reagents and media, label containers adequately and dispose of waste in accordance with legal requirements. - carry out simple tests with cells (e.g. mycoplasma test, cytotoxicity test) according to standard instructions. - 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. - 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. - Record work steps and results obtained in a laboratory book.
Course contents	<ul style="list-style-type: none"> - Introduction to cell culture methods of eukaryotic cells (thawing, medium change, passages, cell counting, freezing) - Training in handling of cell culture relevant laboratory equipment (incubator, laminar flow workbench, centrifuge, microscope) and reagents - Performance of a mycoplasma test and a cytotoxicity test including evaluation
Prerequisites	Biochemie und Molekularbiologie
Assessment Methods	- Test, Protocol
Recommended Reading and Material	- Freshney's Culture of Animal Cells, Capes Davis & Freshney, 2021, Wiley Blackwell
Attendance	There is a compulsory attendance of 100%.
Comments	

Cell Culture Techniques

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

Course description	This course gives an introduction to cell culture techniques.
Teaching methods	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.
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - 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. - 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. - explain standard techniques of aseptic cultivation of eukaryotic cells in detail, to show possibilities for the detection of contamination and to suggest necessary countermeasures. - 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. - 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.
Course contents	<ul style="list-style-type: none"> - Biology of various cell types - Equipment, basic methods and reagents in a cell culture laboratory - Types of contamination and their specific detection - Basic calculations in the cell culture lab - Cell culture methods in various fields of application
Prerequisites	Courses: Biochemie und Molekularbiologie, Biochemielabor, Instrumentelle Analytik in der Labormedizin
Assessment Methods	- Entrance tests, Group work, Handout, Final Exam

Recommended Reading and Material	- Freshney's Culture of Animal Cells, Capes Davis & Freshney, 2021, Wiley Blackwell
Attendance	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	

Biomedical Signals and Medical Sensors 1

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

Course description	project work in the field of "Biomedical Signals and Medical Sensors"
Teaching methods	
Learning outcome	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.
Course contents	- project work
Prerequisites	
Assessment Methods	
Recommended Reading and Material	
Attendance	
Comments	

Body Computer Interaction

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

Course description	project work in the field of "human-computer interaction"
Teaching methods	
Learning outcome	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
Course contents	- Biosignals, their detection and differentiation - Evaluation of biosignals - project work
Prerequisites	
Assessment Methods	
Recommended Reading and Material	
Attendance	
Comments	

Signal Acquisition and Analysis

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

Human Factors and Sports Engineering (BHF)

Materials and Technology for Performance Apparel

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

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

Business English

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

Course description	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
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	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.
Teaching methods	small and medium tasks and activities; open class inputs and discussion; individual task completion settings; peer review and discussion
Learning outcome	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
Course contents	- 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
Prerequisites	B2 level English
Assessment Methods	- 25% Business Impact Analysis Group Task - 25% Business Impact Analysis Language Task - 50% in-class writing
Recommended Reading and Material	- Murphy, R. (2019). English Grammar in Use, 5th Edition. Klett Verlag.
Attendance	Obligatory
Comments	

Smart Homes and Assistive Technologies (BSA)

Fundamentals of Assistive Technologies

Degree programme	BSA
Semester	2
Course methods	ILV

Language	English
ECTS Credits	3.00
Incoming places	Limited

Course description	This course is an introduction to Disability and Assistive Technologies. You will learn about types of disabilities and related medical basics. Other focal points are different types of assistive technologies, accessible design and usability.
Teaching methods	Self-study (short videos, literature), lectures by the lecturers, group work, elaboration of an AT-related task (e.g. research)
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - Identify and classify different types of disabilities - To know the anatomical and physiological reasons for a disability and the resulting impairments - To know the current technical aids to support people with disabilities and to be able to select suitable technologies for certain applications - Explain the basic concepts of Active Assisted Living (AAL) and Augmentative and Alternative Communication (AAC) - Knowing the accessibility requirements for digital documents and websites and being able to check documents for accessibility - Understand the terms "HCI", "Usability" and "UX" and their definitions - To have information on the user centered design process and the associated standardization and to be able to apply it
Course contents	<ul style="list-style-type: none"> - Anatomical and Physiological Background of Disability - Types of Disabilities - Types of Assistive Technologies per disability - Basics of Alternative and Augmentative Communication (AAC) - Basics in Digital Accessibility - Basics in Human Computer Interaction (HCI), Usability and User Interface Design - Principles of Design for All - Use of the Assistive Technology Integration and Construction Set (AsTeRICS) - Use of Arduino IDE and introduction to the Assistive Technologies FLipMouse and FABI
Prerequisites	none
Assessment Methods	- case studies, written/oral exam, assignments

Recommended Reading and Material	<ul style="list-style-type: none"> - Assistive Technology Skriptum (Aigner, David, Deinhofer, Nemec, Sabic, Veigl) - Book: Suzanne Robitaille: The Illustrated Guide to Assistive Technology and Devices (New York: Demos Medical publishing, 2010)
Attendance	mandatory
Comments	none

Microcontroller Technology

Degree programme	BSA
Semester	2
Course methods	LAB
Language	English
ECTS Credits	5.00
Incoming places	Limited

Course description	This class illustrates the use of microcontrollers - in particular, the development of embedded software in order to interface with various peripherals. This involves communication with sensors and control of actuators as well as interfacing with a remote PC for data visualization and remote control.
Teaching methods	Impulse lecture, labs to program a microcontroller by way of a commercial of the shelf evaluation board
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - develop bare-metal embedded systems software. - to make efficient use of embedded build systems (cross-development, remote debugging etc.). - explain the functionality of typical peripheral units (interrupt controller, GPIO, Timer, ADC, UART etc.) and be able to configure and program them. - interact with the environment using the microcontroller along with sensors and actuators. - develop embedded software for degree program tailored tasks and projects using a specific commercial of the shelf development platform.
Course contents	<ul style="list-style-type: none"> - CPU Architectures of modern microcontrollers - Cross-Development & Cross-Debugging

	<ul style="list-style-type: none"> - Reading and working with Circuit Diagrams, Datasheets, Application Notes and a HAL API Documentation - Interrupts - General Purpose Input/Output (GPIO) - Timer, Real-Time Clock, Watchdog - Analog-to-Digital and Digital-to-Analog Conversion (ADC/DAC) - Universal Asynchronous Receiver/Transmitter (UART) - Serial Peripheral Interface (SPI) - Interchip Communication (I2C) - Implementation of degree program specific tasks and projects
Prerequisites	Programming(solid programming skills using C), Digital Logic & Computer Architectures
Assessment Methods	- test, assessment of the submission of individual tasks and projects
Recommended Reading and Material	<ul style="list-style-type: none"> - H. Bernstein, "Mikrocontroller - Grundlagen der Hard- und Software der Mikrocontroller ATtiny2313, ATtiny26 und ATmega32", Springer Vieweg, 2020, ISBN 978-3-658-30066-1. - M. Fischer, "ARM Cortex M4 Cookbook", Packt Publishing, 2016, ISBN-10: 1782176500. - T. Martin, "The Insider's Guide To The STM32 ARM Based Microcontroller", Hitex Ltd., 2008, ISBN: 095499888. - A. Kurniawan, "STM32 Nucleo-32 Development Workshop", PE Press, 2018. - J. Yiu, "The Definitive Guide to ARM Cortex -M3 and Cortex-M4 Processors", Newnes, 2014, ISBN13: 978-0-12-408082-9.
Attendance	mandatory
Comments	none

Business English

Degree programme	BSA
Semester	2
Course methods	UE
Language	English
ECTS Credits	3.00
Incoming places	Limited

Course description	In this Business English course, students will learn how to write clear, compelling, professional text, as well as, expanding their
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	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.
Teaching methods	small and medium tasks and activities; open class inputs and discussion; individual task completion settings; peer review and discussion
Learning outcome	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
Course contents	- 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
Prerequisites	B2 level English
Assessment Methods	- 25% Business Impact Analysis Group Task - 25% Business Impact Analysis Language Task - 50% In-class writing
Recommended Reading and Material	- Murphy, R. (2019). English Grammar in Use, 5th Edition. Klett Verlag.
Attendance	Obligatory
Comments	

Automation Networks

Degree programme	BSA
Semester	4
Course methods	ILV
Language	English

ECTS Credits	3.00
Incoming places	Limited

Course description	This module gives an introduction to the basics of building automation and smart homes.
Teaching methods	
Learning outcome	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
Course contents	<ul style="list-style-type: none"> - 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
Prerequisites	
Assessment Methods	
Recommended Reading and Material	
Attendance	
Comments	

Renewable Energies (BEE)

Applied Computer Science

Degree programme	BEE
Semester	4
Course methods	ILV
Language	English

ECTS Credits	5.00
Incoming places	Limited

Course description	After introducing basic elements of Computer Science (Hardware, Software, networks, development methods and processes) basic programing techniques will be learnt and applied on single-chip-computers.
Teaching methods	
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - explain the structure of a computer - explain the computer architecture and its periphery - compose flow charts - define and formulate a problem statement (from a specification to a computer program) - know and understand the tasks of a programing language - independently code a computer program - handle and apply controlling structures
Course contents	<ul style="list-style-type: none"> - Introduction Computer Science - -Computer systems, Hardware - -Software and its characteristics - -Programing paradigms, programing languages and its - -Software development, development processes - Basics of computer architectures - -Microcontroller vs. Microprocessor - -Operating Systems - -Application examples on Raspberry PI: user interface, file systems, components - -Sensor / actuator elements, networks - Basics of Programing - -Program sequence - -Sequence diagrams – from specification to programs - -Data processing – reading, executing, writing of data - -Data types - -Controlling structures - -Data structures - -Procedures, functions - Model based development - -UML modeling basics - -MatLab, Python
Prerequisites	

Assessment Methods	
Recommended Reading and Material	
Attendance	75 %
Comments	

International Business Engineering (BIW)

Applied Computer Science

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

Course description	<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</p>
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	and by processing Open Data using APIs.
Teaching methods	Combination of classes and self-study phases
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - understand and explain architectures, operating systems and peripherals of computers - analyze and explain problems/tasks, create algorithmic solutions (using flow charts) and implement them using structured programming techniques - 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). - execute software tests - develop practical applications on a Raspberry Pi simulation - develop practical applications based on open data
Course contents	<ul style="list-style-type: none"> - Introduction Computer Science: Computer architecture, hardware, operating systems - Software and its characteristics - Programing paradigms, programing languages and their fields of application - Software development, development processes - Basics of computer architectures - Microcontroller vs. Microprocessor - Introduction to programming with python - Data processing: reading, processing, output of data - Contrul structures and loops - Collections - Functions - File-Handling - Regular Expressions - Application Bundeling - Raspberry Pi - M2M-communication - Open Data
Prerequisites	none
Assessment Methods	<ul style="list-style-type: none"> - Weekly moodle tests - Practical exercises - Moodle exam at the end of the course
Recommended Reading and Material	- Christian Baun, Operating Systems / Betriebssysteme, DOI: 10.1007/978-3-658-29785-5

	<ul style="list-style-type: none"> - Connor P. Milliken, Python Projects for Beginners – A Ten-Week Bootcamp Approach to Python Programming, DOI: 10.1007/978-1-4842-5355-7 - Sunil Kapil, Clean Python – Elegant Coding in Python, DOI: 10.1007/978-1-4842-4878-2 - Python® Notes for Professionals, https://books.goalkicker.com/PythonBook/ (free)
Attendance	
Comments	75%

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"> - to present the technical requirements of the job description of the industrial engineer in practice. - to evaluate and classify problems that predominate in practice. - Applying methodological knowledge in a problem-solving manner in practice. - Explain and apply procedural models for interdisciplinary system development (especially the 3-layer V-model). - Understand the complexity of the interaction between mechanical-electronic software and project management. - to break down, develop and manufacture a complex system into subsystems with the help of the acquired methodological

	competence.
Course contents	<ul style="list-style-type: none"> - Basic terms and historical development in industrial engineering - The job description of the industrial engineer - Industrial engineering in the product development process and product life cycle - System and method competence to develop an individual problem-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
Prerequisites	Production Technology, Management Basics 1 und 2
Assessment Methods	- Course-immanent performance assessment
Recommended Reading and Material	<ul style="list-style-type: none"> - 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
Attendance	Attendance is mandatory according to university standards
Comments	none

Business English

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

Course description	In this Business English course, students will learn how to write
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	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.
Teaching methods	small and medium tasks and activities; open class inputs and discussion; individual task completion settings; peer review and discussion
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - 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
Course contents	<ul style="list-style-type: none"> - 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
Prerequisites	B2 level English
Assessment Methods	<ul style="list-style-type: none"> - 25% Business Impact Analysis Group Task - 25% Business Impact Analysis Language Task - 50% in-class writing
Recommended Reading and Material	- Murphy, R. (2019). English Grammar in Use, 5th Edition. Klett Verlag.
Attendance	75%
Comments	None

Master DEGREE PROGRAMS

AI Engineering (MAI)

Scientific Working

Degree programme	MAI
Semester	2
Course methods	ILV
Language	German
ECTS Credits	3.00
Incoming places	Limited

Course description	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.
Teaching methods	combination of lectures and own presentations
Learning outcome	<p>Nach erfolgreichem Abschluss sind die Studierenden in der Lage, ...</p> <ul style="list-style-type: none"> - identify different types of scientific work - use different types of English literature - 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 - 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 - 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 - present own scientific work as well as scientific work of other people

Course contents	<ul style="list-style-type: none"> - scientific working, writing and methods - finding relevant AI publications - understanding and presenting AI publications
Prerequisites	successfully completed bachelor thesis
Assessment Methods	- contributions during lectures and own presentations
Recommended Reading and Material	- Kornmeier, (2016). Wissenschaftlich schreiben leicht gemacht: Für Bachelor, Master und Dissertation, utb.
Attendance	
Comments	

Healthcare and Rehabilitation Technology (MGR)

Wahlfach - Introduction to MATLAB for Applications in Life Sciences

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

Course description	<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>
Teaching methods	<p>Interactive lectures about selected topics from the field of Life Sciences, Practical solution of assignments by students supported by lecturer, Project consultations</p>
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - Use MATLAB for data manipulation and visualization - Generate signals and perform basic signal operations in MATLAB - Create and use basic digital filters to process signals in MATLAB - Apply gained knowledge and techniques to analyse specific

	biomedical signals (ECG/EMG etc.)
Course contents	<ul style="list-style-type: none"> - Signals classification and properties - Operations with signals and signal generation - Design of digital filters - Biosignal analysis
Prerequisites	Basic programming knowledge, General knowledge from Life Sciences on bachelor level
Assessment Methods	- Activity during lectures
Recommended Reading and Material	<ul style="list-style-type: none"> - V.K. Ingle and J. G. Proakis, Digital Signal Processing Using MATLAB, 1st ed. Pacific Grove, USA: Brooks/Cole Pub. Co., 1999 - A. B. Biran, What Every Engineer Should Know About Matlab and Simulink. New York: Taylor & Francis Group, 2010.
Attendance	Attendance is mandatory, only 20% of absence is tolerated
Comments	

IT-Security (MCS)

Advanced English Communication

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

Course description	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.
Teaching methods	Active participation and discussion .Fulfilment of writing assignments and presentation

Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - understand the importance of culture to a firm. - explain the characteristics of an innovative culture. - develop concepts for how an organisation can become more innovative. - use of subject specific English vocabulary - write a argumentative, coherent and academically written seminar paper on the subject of corporate culture and innovation
Course contents	<ul style="list-style-type: none"> - Innovative corporate cultures - New themes in innovation and how they can be applied to businesses - Critical thinking in seminar discussions - Advanced presentation techniques - Schumpeter's concept of creative destruction / Schien's theory of leadership / Cameron and Quinn's model for diagnosing organisational culture - Case studies: Innovative businesses, e.g. Google, Apple, Toyota - Overview and application of key concepts in writing an academic paper
Prerequisites	Common European Framework of Reference for Languages Level B2
Assessment Methods	- Group Presentation; Group Seminar Paper; Participation
Recommended Reading and Material	- Lecturer Handouts
Attendance	Compulsory
Comments	

Scientific Writing

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

Course description	The focus of the course is an overview of academic language and
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	formal criteria required for writing and presenting a conference paper, and writing an abstract.
Teaching methods	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.
Learning outcome	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
Course contents	<ul style="list-style-type: none"> - The role, content, structure, and style of a conference paper - The role, content, style and types of scientific abstracts - Language-related criteria of a conference paper and an abstract - Writing a conference paper and abstract - Presenting a conference paper
Prerequisites	Completion of previous semester courses
Assessment Methods	- Active participation in class activities and timely completion of assignments
Recommended Reading and Material	- Göschka, M. et al (2014) Guidelines for Scientific Writing, Skriptum Additional current handouts
Attendance	Attendance is compulsory at all lessons for this course.
Comments	

Tissue Engineering and Regenerative Medicine (MTE)

Gene Regulation and Signal Transduction

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

Course description	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 regenerative medicine.
Teaching methods	Lecture presenting basics and applied examples.
Learning outcome	After passing this course successfully students are able to ... <ul style="list-style-type: none"> - 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
Course contents	<ul style="list-style-type: none"> - signaling pathways (RAF-MEK-ERK, mTOR/AKT, Wnt/beta-catenin) - apoptosis - mechanotransduction - aspects of cellular signaling in Tissue Engineering - introduction to bioinformatics
Prerequisites	Molecular Biochemistry and Cell Biology
Assessment Methods	- final written exam
Recommended Reading and Material	- current scientific literature suggested by lecturers
Attendance	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.
Comments	

Study Design and Biostatistics

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

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

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

Course description	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.
Teaching methods	
Learning outcome	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
Course contents	<ul style="list-style-type: none"> - Fundamental positions of bioethical decision-making and argumentation - Experiments with human subjects and animals - Ethics issues of resource allocation - Ethical concepts to health-disease/illness-disabilities - Intercultural ethical aspects of bioengineering and biotechnology - Medical information systems (e-health, data security, privacy, confidentiality)
Prerequisites	none
Assessment Methods	- Course immanent assessment method (grade)
Recommended Reading and Material	- Literature at the beginning of the course
Attendance	Attendance is compulsory according to the statutes
Comments	Contentual coordination with the English course in which issues of bioethics are treated as well

Biotechnology

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

Course description	Design and optimization of recombinant protein production
Teaching methods	Basics and theory are presented within an interactive lecture. Practical examples for application are discussed.
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - Bioprocess design for the production of recombinant proteins from gene to purified product applying microbial and/or mammalian systems - Choice of appropriate expression systems and plasmids for recombinant production

	<ul style="list-style-type: none"> - Definition of strategies for product development and expression systems - Characterization of concept and principle of bioprocess design (up- and downstream processing) - Design and characterization of various bioreactor types - Application of high-level data exploration and interpretation - Combination of gained knowledge with scientific state of the art - Characterization, interpretation, and application of function and interactivity of complex systems
Course contents	<ul style="list-style-type: none"> - Recombinant protein production: (1) Basics and expression strategies - Expression hosts: (1) overview: Pro- and eukaryotic expression systems - 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 - Downstream Processing (DSP): (1) DSP design, (2) DSP Unit operations: A) Cell separation (centrifugation, filtration) and cell disintegration, B) Protein Purification (Chromatography) - Continuous manufacturing: (1) USP, DSP and analytics - Multivariate data analysis: (1) Design of Experiments (DoE)
Prerequisites	Basics biology, mathematics, physics
Assessment Methods	- Written exam
Recommended Reading and Material	<ul style="list-style-type: none"> - Bioprocess Engineering Principles, Pauline M Doran, 2nd edition ISBN 978-0-12-220851-5 - Bioprozesstechnik, Horst Chmiel, ISBN 978-3-8274-2476-1 - Taschenatlas der Biotechnologie und Gentechnik, Rolf D. Schmid ISBN 978-3-527-33514-5
Attendance	
Comments	

Power Electronics (MLE)

Intercultural Communications

Degree programme	MLE
Semester	2
Course methods	SE

Language	English
ECTS Credits	1.50
Incoming places	Limited

Course description	We aim at raising intercultural awareness and broadening the students' horizons
Teaching methods	
Learning outcome	After passing this course successfully students are able to ... - meet the challenges of communicating with members of other cultures - recognize the potential of working in an intercultural team - act flexibly and confidently in an unknown environment
Course contents	- Terms and theories of culture: Johari window, Iceberg theory etc. - Manifestations of culture - Inside and outside perspectives on culture
Prerequisites	Completion of previous semester courses
Assessment Methods	- Grade depends on: - Attendance - Presentation of an intercultural aspect in class - Participation in class discussions
Recommended Reading and Material	- Lewis, R.D. et al (2012) When Cultures Collide 3rd ed., Nicholas Brealey International - Additional current handouts and audio-visual support
Attendance	Attendance is compulsory
Comments	

Medical Engineering & eHealth (MME)

Writing the Master's Thesis

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

Bioinformatics

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

Course description	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.
Teaching methods	Seminar / Workshop, problem based learning
Learning outcome	After passing this course successfully students are able to ... - describe biological systems - select computer aided methods for successfully investigating biomedical systems and data - apply selected computer-aided methods for analysing biomedical systems and data
Course contents	- Introduction Bioinformatics, Computational Biology and Systems Theory, DNA Sequencing, modelling epidemics - Technologies for analysing biological data and systems (z.B. Python, BLAST, SIR, K-means, Clustering, numerical for differential equations, cellular automata) - practical tasks (adapted to students background)
Prerequisites	Basic computer science background Basic programming skills Basic biomedical background
Assessment Methods	- Assignments - Presentation
Recommended Reading and Material	- Provided per topic in course
Attendance	
Comments	

Artificial Intelligence

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

Course description	This Lecture builds up knowledge about the algorithms and the basics of artificial intelligence (AI) and soft computing
Teaching methods	Theory, Examples, Exercises
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - describe agents and environments - describe the concept of rational behavior - distinguish between different problem environments - distinguish between agent structures - name problem-solving agents - design a kind of goal-based agent - distinguish between problem types - do a graph search with partial information - find a defined problem formulation - name the basic search algorithms including: e.g. uninformed search strategies - enabling a constraint satisfactory search - using informed search strategies - define the first heuristic functions for the informed search - know, how to apply simulated annealing techniques - know how to apply evolutionary algorithms
Course contents	<ul style="list-style-type: none"> - Basic algorithms of artificial Intelligence - Agents - Problem Solving strategies - Informed Search - Constraint Satisfactory Problems - AI and Games
Prerequisites	
Assessment Methods	- Exercises (20%) and project (80%)
Recommended Reading and Material	- Artificial Intelligence: A Modern Approach (Prentice Hall Series in Artificial Intelligence) Stuart Russell, Peter Norvig

Attendance	Attendance not required but recommended!The student needs to be present for the project meetings and final presentation.
Comments	

Electromagnetic Compatibility

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

Course description	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
Teaching methods	Lessons and practical homework (1 assignment, chosen from several proposals)The course will be held in 10 units (6:35 - 9:00 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
Learning outcome	After passing this course successfully students are able to ... <ul style="list-style-type: none"> - identify potential problems of electromagnetic compatibility during product development - apply the fundamental EMC design rules in practice - 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 - estimate the relevance of exposure situations in practice - name the technical possibilities of exposure assessment, their advantages and drawbacks and their limitations

	<ul style="list-style-type: none"> - identify potentially hazardous situations regarding electromagnetic interference with electronic implants in practice - name the most important directives, standards and guidelines relevant for limiting personal exposure against electromagnetic fields
Course contents	<ul style="list-style-type: none"> - Part 1 (Lamedschwandner): - Introduction to Electromagnetic Compatibility (EMC) - EMC conformity assessment - European Union directives and CE marking of products - The EMC directive - EMC standards - EMC test methods - Functional safety and EMC - Development of electrical appliances with respect to EMC - Design basics - Printed circuit board design - Cabling, grounding and shielded cables - EMC filters, ferrites and box shielding - Economic EMC design principle - Part 2 (Schmid): - Biophysical basics - Effects of electromagnetic fields on the human body - Excitation of cells by induced currents (low frequency fields) - Tissue heating by power absorption (radio frequency and microwave fields) - Other reported, but not yet established effects - Safety limits and regulatory basics - Exposure assessment methods - Electromagnetic interference with implants - Malfunction of electronic implants - Concentration of currents by metallic implants - Movement of ferromagnetic implants in strong magnetic fields
Prerequisites	Fundamentals of electrical engineering
Assessment Methods	<ul style="list-style-type: none"> - Solution and Presentation of homework (50%) - Written exam (50%)
Recommended Reading and Material	<ul style="list-style-type: none"> - Lamedschwandner K. EMC for MBE – Part 1, Chapter 1-3. Presentation Slides. Available in download section of the course - Paul CR. 2006. Introduction to Electromagnetic Compatibility, 2nd Edition, Wiley, New York, ISBN: 978-0-471-75500-5 - Schmid G. EMC for MBE. Part 2, EMF Safety. Presentation Slides. Available in download section of the course

Attendance	Attendance is compulsory
Comments	

Ethics

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

Course description	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.
Teaching methods	Seminar: Theory Inputs Case Studies Group work Ethical arguing Discussions
Learning outcome	After passing this course successfully students are able to ... - outline selected basic terms and principles of medical 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 medicine and engineering. - 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.
Course contents	<ul style="list-style-type: none"> - Fundamental positions of ethical decision-making and argumentation - Experiments with human subjects and animals - Ethics issues of resource allocation - Ethical concepts to health-disease/illness-disabilities - Intercultural ethical aspects of medicine and engineering - Medical information systems (eHealth, data security, privacy, confidentiality)
Prerequisites	

Assessment Methods	<ul style="list-style-type: none"> - Course with an immanent character (grade): - Introduction into a chosen topic by the student - Hand out - The student is leading a discourse about the chosen in the group
Recommended Reading and Material	- Literature at the beginning of the course
Attendance	Attendance is compulsory
Comments	

Study Design and Biostatistics

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

Course description	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 conclusions based on this data sets.
Teaching methods	Lecture & Examples
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - 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 - 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 - relate research questions and results to a medical environment
Course contents	<ul style="list-style-type: none"> - Testing methods for frequencies - Testing methods for rank-data - Testing methods for cardinal data

	<ul style="list-style-type: none"> - Relationship metrics and their tests - Agreement metric
Prerequisites	Parametric Statistics. The only mathematical prerequisite needed for the material found in the outline is arithmetic and some basic algebra.Excel, MatLab/Octave
Assessment Methods	<ul style="list-style-type: none"> - written exam 50% - moolde examples 50%
Recommended Reading and Material	<ul style="list-style-type: none"> - Elementary Statistics, Mario F. TriolaPublication Date: January 6, 2011 ISBN-10: 0321694503 ISBN-13: 978-0321694508 Edition: 11 - 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.
Attendance	optional
Comments	

Scientific Publishing

Degree programme	MME
Semester	2
Course methods	SE
Language	English
ECTS Credits	1.50
Incoming places	Limited

Course description	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.
Teaching methods	Upfront teaching, group work, students presentation
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - Explain the structure of a scientific paper - Write a scientific abstract according to scientific journals rules - Can explain the process from having a first idea to getting a paper accepted - Can prepare a scientfic presentation (oral, poster) for a scientific conference

Course contents	<ul style="list-style-type: none"> - What to do before a (scientific) paper is written - Structures of scientific papers - Basics of scientific writing - Literature search, Inside PubMed - Critical Comments about today's publication behavior - What else is needed to get a publication accepted - The review - The Scientific Conference - Paper / Poster Presentation
Prerequisites	Basic writing skills
Assessment Methods	<ul style="list-style-type: none"> - Quality of a self written abstract - Evaluation of other abstracts - Quality of "scientific conference like" presentation - Evaluation of presentations - Written exam
Recommended Reading and Material	- http://www.icmje.org
Attendance	
Comments	

Advanced Optics

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

Course description	Geometric Optics, Microscopy Techniques & Spectroscopy (including medical applications)
Teaching methods	Frontal lecture Advanced Optics Laboratory exercises (spectroscopy + microscope, mechanical eye model)
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - explain Maxwell's equations and simple conclusions from them - define basic properties of light and the behavior at interfaces (refraction, (total) reflection, polarization, Fresnel formulas, Brewster

	<p>law)</p> <ul style="list-style-type: none"> - represent applications of optical components (lenses, mirrors, prisms, optical fibers, diffraction gratings, classical light sources, LED, laser, polarizers) simple optical systems (light microscope) - 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) - define spherical aberrations, coma, astigmatism, chromatic aberration, distortions, explain Abbe's diffraction limit, classifying Zernike polynomials with respect to the context - illustrate discussed microscopic techniques and their advantages, represent the functioning of the human eye based on the eye model - present basics of spectroscopy and explain medical application of scattering (Raman, Brillouin)
Course contents	<ul style="list-style-type: none"> - Motivational introduction to modern optical topics (computer-generated holograms, laser physics, metamaterials) - Meaning of the Maxwell's equations + simple conclusions from them, behavior of light rays in propagation + at interfaces (refraction, (total) reflection, Brewstergesetz, Fresnel formulas) - Overview of optical components (lenses, mirrors, prisms, optical fibers, diffraction gratings, classical light sources, LED, lasers, polarizers), thin & thick lenses, mirrors (image construction, matrix method) - Aberrations (characterization, minimization, spherical aberration, coma, astigmatism, distortion, chromatic aberration, Abbe diffraction limit, Zernike polynomials) - Microscopy techniques + mechanical eye Model - Spectroscopy in general with focus on: Raman and Brillouin scattering
Prerequisites	Basics of Analysis and Algebra, Basics of Physics
Assessment Methods	<ul style="list-style-type: none"> - Written exam - 1 Laboratory protocol
Recommended Reading and Material	<ul style="list-style-type: none"> - Bergmann & Schäfer. "Lehrbuch der Experimentalphysik". Band 3. Optik. 2004. - Bergmann & Schäfer. "Lehrbuch der Experimentalphysik". Band 3. Optik. 2004. - Born & Wolf. "Principles of Optics". 1999
Attendance	Frontal lectures: 80% Laboratory exercises: 100%
Comments	

Project Management and Leadership Skills

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

Course description	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.
Teaching methods	Theory inputTeamworkRole play
Learning outcome	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.
Course contents	<ul style="list-style-type: none"> - Leadership styles and instruments (for example staff appraisal) - Motivation, promotion and development of employees - Leadership functions versus professional tasks - Consequence of "not leading" - Role of the leader in a change process - Dealing with crises, success and failures
Prerequisites	Team Management Skills
Assessment Methods	- An individual reflection paper about the leadership issues encountered in the semester and how the knowledge about leadership was applied.
Recommended Reading and Material	<ul style="list-style-type: none"> - Daft, R. (2008): New Era of Management, Mason/Ohio:Thomson - Pettinger, R. (2007): Introduction to Management, Houndmills/Hampshire: Palgrave Macmillan - Schermerhorn, J. (2008): Management, Hoboken/New Jersey: John

	Wiley
Attendance	Attendance is compulsory
Comments	This course may reflect team experiences from elsewhere, e.g from the Project Related Teamwork course.

eHealth Applications

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

Course description	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.
Teaching methods	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.
Learning outcome	After passing this course successfully students are able to ... <ul style="list-style-type: none"> - 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
Course contents	<ul style="list-style-type: none"> - 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

Prerequisites	Basic knowledge of software development, familiarity with the medical field
Assessment Methods	- Seminar paper: Evidence based recommendation to stakeholders
Recommended Reading and Material	- eHealth Action Plan 2012-2020 (http://ec.europa.eu/health/ehealth/docs/com_2012_736_en.pdf)
Attendance	The course uses PBL therefore attendance is mandatory.
Comments	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

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

Course description	The course introduces the main processes and steps of implementing quality management systems for design and development and putting to market of medical devices. It provides the necessary steps for addressing regulatory issues in an application oriented perspective.
Teaching methods	Lectures will introduce the topics. Students will extend their knowledge and skills in small assignments.
Learning outcome	After passing this course successfully students are able to ... - describe and handle processes to address regulatory issues of medical devices, regarding especially the "Medical Device Directive" - use quality management systems to address regulatory issues in a structured way - describe and perform measures of risk management, generally and in the sense of a "Medical IT-Network Risk Manager" (IEC 80001-1).
Course contents	- 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

	<p>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, ...).</p> <p>- 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.</p> <p>- Further fields of expertise (EMC, Biocompatibility, RoHS...). Clinical evaluation. EU vigilance system. IVDs, AIMDD. International requirements (FDA, CMDCAS, GxP, UL, ...).</p>
Prerequisites	- Basic concepts of device or software development. - Basic concepts of quality.
Assessment Methods	- Final exam and smaller assignments
Recommended Reading and Material	- See learning platform
Attendance	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.
Comments	

Innovation and Technology Management (MTM)

Agile Software-Development & Lean UX

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

Course description	This course shows students the interplay between agile project management, user experience design and its efficient and effective
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	integration, the so-called "Lean UX". The acquired knowledge is put into practice in the context of several exercises and a final project
Teaching methods	Self-study, lecture, discussion, group work, practical examples, online tutorials, project work.
Learning outcome	After passing this course successfully students are able to ... <ul style="list-style-type: none"> - Apply methods of agile project management in practice (including effort estimation, user stories, software requirements specification) - build and coordinate project teams in an agile environment - 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) - plan and implement projects considering the "Lean UX" aspect
Course contents	<ul style="list-style-type: none"> - Agile project management (Scrum, Kanban etc.) - user experience - Software development - user stories - Effort estimation in software projects - Software Requirements Specification - Relevant standards - Subject- and expert-based methods - Personas - Prototyping - Eyetracking - Usability Lab - Minimum Viable Product - Discount Usability - UX Canvas
Prerequisites	Basics of computer science as well as basics of project management
Assessment Methods	immanent performances (30%) + project work (70%)
Recommended Reading and Material	<ul style="list-style-type: none"> - Gothelf, Lean UX: Applying Lean Principles to Improve User Experience, aktuelle Auflage - Richter/Flücker, Usability und UX kompakt: Produkte für Menschen, aktuelle Auflage - Roock/Wolf, Scrum verstehen und erfolgreich einsetzen, aktuelle Auflage
Attendance	In principle, attendance is compulsory
Comments	Further information and teaching materials will be made available via

	the accompanying Moodle course.
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Changemanagement

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

Course description	In the course of the module, students will acquire basic competences in the area of organizational change management. A thematic focus will be on the topic of sustainability transitions.
Teaching methods	Presentation, self-study, exercises, exchange of experiences, discussion, case studies
Learning outcome	After passing this course successfully students are able to ... <ul style="list-style-type: none"> - distinguish types of change - anticipate internal and external barriers to successful change - identify success factors for change - plan change management processes - define the most important steps and measures for a concrete change - understand reasons for resistance to change
Course contents	<ul style="list-style-type: none"> - Types of change - Phases of change - Barriers to change - Success factors for change - Reasons why change efforts fail - Change management
Prerequisites	Basics of business studies
Assessment Methods	<ul style="list-style-type: none"> - group case work 1 (20%) - group case work 2 (20%) - final exam (60%)
Recommended Reading and Material	- 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.

Attendance	The course will be held face to face in class. One session will take place in self-study mode (with lecture casts and a movie). The final exam will take place face to face.
Comments	Further details will be provided in the Moodle Course.

Cost Management and Corporate Finance

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

Course description	During this course, students acquire further knowledge in the fields of financial analysis, cost management, financing and company valuation.
Teaching methods	lecture, exercises, discussion, e-learning, self-study, flipped classroom, business game
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - to assess the advantage of an investment project by means of static or dynamic investment calculation - outline the typical contents of an investment guideline - Identify and implement cost reduction measures - Identify and implement measures to variabilize fixed costs - Calculate key figures to analyze the asset, profitability and liquidity situation - distinguish between different types of financing - determine the value of a company using the discounted cash flow method
Course contents	<ul style="list-style-type: none"> - Accounting - Statement analysis - Cost management - capital budgeting - corporate financing - business valuation
Prerequisites	Basics of business administration, accounting, cost accounting

Assessment Methods	- written final examination (50%) + points for immanent performance business game (50%)
Recommended Reading and Material	<ul style="list-style-type: none"> - Berk, Jonathan, and Peter DeMarzo. Corporate Finance. Actual Edition. Harlow: Pearson Education Limited - Brealey, Richard A., Stewart C. Myers, und Franklin Allen. Principles of Corporate Finance. New York: McGraw-Hill Higher Education - Charles T. Horngren; Srikant M. Datar; Madhav V. Rajan, Cost Accounting, Global Edition, Pearson Education Limited - Eisl/Hofer/Losbichler, Grundlagen der finanziellen Unternehmensführung. Band IV: Controlling - Losbichler, Grundlagen der finanziellen Unternehmensführung. Band III: Cashflow, Investition und Finanzierung
Attendance	Block 1 is generally not subject to compulsory attendance, Block 2 is subject to compulsory attendance
Comments	Further information on the course and the teaching materials used will be provided in the accompanying Moodle course.

Enterprise Simulation

Degree programme	MTM
Semester	4
Course methods	UE
Language	English
ECTS Credits	4.00
Incoming places	Limited

Course description	In this course, students gain experience in strategic decisions of technology management as well as in operational questions of corporate management in the context of a business simulation. Through the use of a business simulation, students can directly experience the effects of their own decisions (with a focus on investment in research and development) and try out different strategies. Decision making in small groups promotes critical discourse.
Teaching methods	Business simulation, individual and team work, written elaborations (individual and group work), short presentation, regular feedback, discussion

Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - Understanding of strategic technology decisions (investments, timing of change, etc.), - active use of the S-curve concept, - make fundamental business (and above all operational) decisions (price, production quantity, etc.), - act and react independently in a competitive, technology-driven competitive environment - understand fundamental relationships in technology-driven markets, - to conduct negotiations if necessary (within the company as well as with regard to technological cooperations), - the independent and active trying out and experiencing of different strategic options for action
Course contents	<ul style="list-style-type: none"> - Technology management in particular technology development - S-curve concept - fundamental business management decisions (DB etc.) - selected interrelationships of innovation and technology management
Prerequisites	Fundamentals of business administration as well as innovation and technology management are required
Assessment Methods	<ul style="list-style-type: none"> - Due to the course concept, continuous attendance is absolutely necessary and a prerequisite for positive completion of the entire course - Success in the evaluation game (20%) + written individual work (40%) + written group work (40%) - Plagiarism in at least one of the partial performances means that the course cannot be completed positively.
Recommended Reading and Material	Recommended additional literature: Foster, R., Innovation: The technological offensive, Wiesbaden 1986.
Attendance	Attendance is mandatory
Comments	Detailed information and additional teaching materials are made available via the learning platform moodle.

Information Systems Management (MWI)

System Integration

Degree programme	MWI
Semester	2

Course methods	ILV, FL
Language	English
ECTS Credits	5.00
Incoming places	Limited

Course description	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.
Teaching methods	SATs, practical exercises, preparation and presentation of a related topic as part of the group project
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - 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 integration patterns. - explain the purpose of transactions and their use as atomic or long-running transactions within enterprise application integration solutions. - reproduce and evaluate the advantages and disadvantages of enterprise application integration patterns to develop a suitable integration software design. - analyse and to make use of the different roles and environments needed as part of the software development process. - apply the basic principles of web services to implement a service solution. - develop an enterprise application integration solution by using Microsoft BizTalk Server as messaging middleware.
Course contents	<ul style="list-style-type: none"> - Message based communication - Web services - Enterprise application integration - Reliability and environments

	<ul style="list-style-type: none"> - Message broker - Content-based routing - Business process modeling - Transactions
Prerequisites	
Assessment Methods	<ul style="list-style-type: none"> - SATs - 10% - Practical exercises - 30% - Group project - 30% - Final Exam - 30%
Recommended Reading and Material	<ul style="list-style-type: none"> - Course book - VMware image including a complete Microsoft BizTalk Installation
Attendance	
Comments	

Industrial Engineering & Business (MIB)

Int. Marketing and Product Management

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

Course description	<p>Internationalization, globalization and culturalization are currently 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</p>
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	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.
Teaching methods	
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - explain the main spheres of activity of internationalization by Kotler and implement their consequence on the basis of practical cases decisions (Case Studies). - 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. - assess different brands from the FMCG, IGM and DLM regarding their internationalization and positioning strategies and identify the differences in the respective marketing mix. - 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. - 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.
Course contents	<ul style="list-style-type: none"> - Introduction to the global product and brand management - Global product strategies and their origins - Management of global brands during the product life cycle - Standardization versus adaption - Analysis of various branding strategies based on familiar examples
Prerequisites	<ul style="list-style-type: none"> - Basic Knowledge of Mainstream Marketing and Business Administration- English speaking and writing Level C1
Assessment Methods	<ul style="list-style-type: none"> - written exam (75%) - exams via Moodle (each 5%, total 25%)
Recommended Reading and Material	<ul style="list-style-type: none"> - Hollensen (2012): Essentials of Global Marketing, Pearson - Müller/Gelbrich (2004): Interkulturelles Marketing, Vahlens - Usunier/Lee (2012): Marketing Across cultures, Pearson

Attendance	Attendance is compulsory
Comments	

Software Engineering (MSE)

Mobile Application Engineering

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

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

Attendance	required
Comments	If there are not enough registrations the course cannot take place

Selected Topics Software Management

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

Course description	Graduates of this course receive indepth kowledge 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
Teaching methods	Lecture with student participationBest PracticeUse CasesCase studies
Learning outcome	After passing this course successfully students are able to ... <ul style="list-style-type: none"> - Draw Project portfolio-Management and corporate strategies - Define international technology exploitation - Overview about tools and approaches - Identify international technology exploitation networks - Agile project management
Course contents	<ul style="list-style-type: none"> - Project management - Project portfolio management - Agile project management - Technology exploitation
Prerequisites	Basics Project Management
Assessment Methods	- Course immanent assessment method and group assignment
Recommended Reading and Material	- Agile Prozesse: Von XP über Scrum bis MAP, Eckhart Hanser
Attendance	requiered
Comments	- Hands-on course: Experts from corporates/startups are being

	invited/visited - If there are not enough registrations the course cannot take place
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User Experience Evaluation

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

Course description	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.
Teaching methods	Practical exercises and examples, discussions, group work, lectures
Learning outcome	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
Course contents	- UX metrics - suitable statistical methods - data visualization - reproducibility of tests
Prerequisites	Basics of user centered designs and software usability
Assessment Methods	- Course immanent assessment method and/ or end exam
Recommended Reading and Material	- Tullis, Thomas / Albert, William. (2008) Measuring the User Experience : Collecting, Analyzing, and Presenting Usability Metrics, Morgan Kaufmann, ISBN-13: 978-0123735584 - Sauro, Jeff. (2012) Quantifying the User Experience : Practical Statistics for User Research, Morgan Kaufmann, ISBN-13: 978-0123849687 - Bortz, Jürgen / Lienert, Gustav A. (2003) Kurzgefasste Statistik für

	die klinische Forschung : Leitfaden für die verteilungsfreie Analyse kleiner Stichproben, Springer, ISBN-13: 978-3540757375
Attendance	
Comments	If there are not enough registrations the course cannot take place

Artificial Intelligence and Visual Computing

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

Natural Intelligence and Artificial Intelligence

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

Course description	Evolution designed biological systems. Methods to make decisions with limited computational resources have been optimized over millions of years. Many of these methods can potentially open up new and more effective possibilities for AI systems. This course shows examples of some methods. Their possible application in AI systems is discussed.
Teaching methods	Lesson, discussion, students work and presentation.
Learning outcome	After passing this course successfully students are able to ... - describe two principles used in biological systems to improve decision making - explain one possible application of such principles
Course contents	- What is the meaning of the term "Intelligent System"? - The brain and brain structures of different species

	<ul style="list-style-type: none"> - Intelligent behavior in the animal kingdom in relation to the term "intelligence" - Feed back and feed forward loops and consciousness - Feedback and feed forward loops and the role of the human consciousness. - Object detection and recognition in humans - Comparisons of AI and the biological counterpart - Attention control systems in humans
Prerequisites	Basic knowledge of AI systems
Assessment Methods	- Continuous assessment
Recommended Reading and Material	- see German version
Attendance	not required
Comments	If there are not enough registrations the course cannot take place

UX Requirements Engineering

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

Course description	This course conveys the basics of requirements engineering in the area of Human-Systems Interaction / User Experience. In accordance with current international standards, the course covers everything from requirements elicitation and derivation to user requirements specification, as well as the prioritization and weighting of requirements in the area of UX/human-centered design.
Teaching methods	Practical exercises and examples, discussions, group work, lectures
Learning outcome	<p>After passing this course successfully students are able to ...</p> <ul style="list-style-type: none"> - identify user needs and formulate them in a standard-compliant manner - specify user / UX requirements and formulate them in a standard-compliant manner - is able to differentiate between UX/ User Requirements types

	- to prioritize and weight UX /User Requirements
Course contents	<ul style="list-style-type: none"> - Human-centered design: Requirements management according to ISO 9241-210 - User Needs Analysis & Report according to ISO/IEC 250064 - User Requirements Specification according to ISO 25065 - Prioritization of requirements - Weighting of requirements based on obtainability - Consensus building
Prerequisites	Basics of User Centered Design and Software Usability
Assessment Methods	- Course-immanent performance assessment and/ or final exam.
Recommended Reading and Material	<ul style="list-style-type: none"> - ISO 9241-210:2019: Ergonomics of human-system interaction — Part 210: Human-centred design for interactive systems - ISO/IEC 25064:2013: Systems and software engineering — Software product Quality Requirements and Evaluation (SQuaRE) — Common Industry Format (CIF) for usability: User needs report - ISO 25065:2019: Systems and software engineering — Software product Quality Requirements and Evaluation (SQuaRE) — Common Industry Format (CIF) for Usability: User requirements specification - Wieggers, K & Beatty, J: Software Requirements, Microsoft Press, ISBN 978-0-7356-7966-5
Attendance	Mandatory
Comments	If there are not enough registrations the course cannot take place

Mental Power for IT Disciplines

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

Course description	In this course you will learn to use the whole capacity of your brain to solve problems and to achieve any goal you wish.
Teaching methods	- Seminar- Distant Learning
Learning outcome	<p>Nach erfolgreichem Abschluss sind die Studierenden in der Lage, ...</p> <ul style="list-style-type: none"> - 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
Course contents	- 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
Prerequisites	Completion of all previous MSE courses
Assessment Methods	- Continuous assessment
Recommended Reading and Material	- 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
Attendance	Required
Comments	If there are not enough registrations the course cannot take place

Docker / Swagger

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

Course description	This course will provide an overview of the capabilities and possibilities of using container-based virtualization technologies, examining Docker as an example in detail. Additionally Swagger, a framework to create RESTful services/APIs will be explored.
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Teaching methods	Seminar and distant learning
Learning outcome	Nach erfolgreichem Abschluss sind die Studierenden in der Lage, ... - understand and explain container-based virtualization - decide when (not) to use container-based virtualization - understand and explain RESTful services/APIs - create a RESTful service/API using Swagger
Course contents	- overview of different virtualization technologies - Docker, a container-based virtualization technology - RESTful services/APIs - Swagger, a framework to create RESTful services/APIs
Prerequisites	none (basic knowledge of IT/concept of virtualization helpful)
Assessment Methods	- Continuous assessment
Recommended Reading and Material	- https://docs.docker.com/get-started/ - https://swagger.io/getting-started/
Attendance	Required (+distant learning)
Comments	If there are not enough registrations the course cannot take place

Application Lifecycle Management

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

Course description	The course informs about the central role ALM plays in the industry, as about 75% of the software development effort is expended for maintenance and evolution. The course covers the full lifecycle starting with a software product idea and ending with the discontinuation of the software. The competences in the areas of software innovation management, systems integration and change and configuration management are enhanced by theoretical and practical exercises. Whenever possible, practice examples from the industry are used.
Teaching methods	Self study (knowledge + practical exercises)In class, there areClarifications, if neededGroup exercisesPresentations of the

	results achieved at homeIndividual exercisesExchange of experiences made in the industry
Learning outcome	Nach erfolgreichem Abschluss sind die Studierenden in der Lage, ... - decide whether implementing a given software product idea makes sense economically - integrate a software system into an application landscape - set up a change and configuration management system
Course contents	<ul style="list-style-type: none"> - End-to-end overview of the application life cycle - Scoring and business case of software products - Agile system integration - Data migration - Change management - Defect management - Configuration management
Prerequisites	Software development on the bachelor levelProfessional experience in software engineering
Assessment Methods	<ul style="list-style-type: none"> - Grading of individual practice in class - Grading of group practice in class - Grading of home practice
Recommended Reading and Material	<ul style="list-style-type: none"> - Sneed H., Hasitschka M., Teichmann M., Software Produktmanagement, d-punkt, Heidelberg, 2004 - Kittlaus H., Rau C., Schulz J., Software-Produkt-Management: Nachhaltiger Erfolgsfaktor bei Herstellern und Anwendern, Springer, 2013 - IEEE Std 14764 Software Life Cycle Processes — Maintenance - IEEE Std 1219 Software Maintenance
Attendance	Attendance is compulsory.
Comments	If there are not enough registrations the course cannot take place

Sports Technology (MST)

Start-up Management

Degree programme	MST
Semester	4
Course methods	VO
Language	English

ECTS Credits	3.00
Incoming places	Limited

Course description	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.
Teaching methods	-) Theory lectures-) Video tutorials-) Material for self-study-) Teamwork-) Coaching sessions•Buzz groups•Feedback
Learning outcome	After passing this course successfully students are able to ... <ul style="list-style-type: none"> - 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
Course contents	<ul style="list-style-type: none"> - 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
Prerequisites	Understanding the principles of business administration.
Assessment Methods	<ul style="list-style-type: none"> - 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%
Recommended Reading and Material	<ul style="list-style-type: none"> - 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
Attendance	Attendance is generally recommended.
Comments	

Digital Leadership and New World of Work

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

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

Environmental Management and Ecotoxicology (MUT)

Cell Biology & Alternative Methods to Animal Testing

Degree programme	MUT
Semester	2
Course methods	ILV
Language	German
ECTS Credits	3.00
Incoming places	Limited

Course description	Students achieve detailed knowledge of molecular biological and (cell)biological processes in eukaryotic and prokaryotic cells, especially in relation to current topics in ecotoxicology. In addition, the problems of the use of animals in laboratory medicine will be discussed, as well as possibilities for alternatives. Various methods for reducing animal experiments and legal aspects of animal trails will be discussed.
Teaching methods	

Learning outcome	<p>Nach erfolgreichem Abschluss sind die Studierenden in der Lage, ...</p> <ul style="list-style-type: none"> - explain in detail replication, translation, regulation of gene expression, repair and recombination. - explain protein sorting and intracellular transport and explain basic mechanisms of cell communication, cell cycle and cell division. - update the acquired knowledge with the help of relevant publications and integrate it into concepts of ecotoxicology. - solve problems from research related to the above content. - explain the 3 R strategy (Reduce, Replace, Refine). - provide and describe examples of alternatives to animal testing. - provide an overview of relevant legal aspects.
Course contents	<ul style="list-style-type: none"> - structure and function of the cell. - regulation of gene expression - organisation of the cell - communication of the cell - 3R-strategies - methods as alternatives to animal testing (based on cells, organoids, non-vertebrates). - cell chips and multi-organ chips as a way to test drugs - relevant legal aspects
Prerequisites	Molekularbiologie und Mikrobiologie
Assessment Methods	- eLearning with quizzes, group work, final exam
Recommended Reading and Material	- Alberts, The Cell ; scientific publications
Attendance	Attendance of at least 75% is mandatory, if more than 25% of the units are missed, the first exam entry will be lost
Comments	

Epigenetics

Degree programme	MUT
Semester	2
Course methods	ILV
Language	German
ECTS Credits	2.00
Incoming places	Limited

Course description	The fundamentals of epigenetics are presented and considered in context of their ecological impacts. Current results from literature on these topics will be presented by students and then discussed and evaluated in the group.
Teaching methods	Lectures, group discussions of central topics, presentations by the students
Learning outcome	Nach erfolgreichem Abschluss sind die Studierenden in der Lage, ... - describe epigenetic processes in a cell. - understand the relationship between the genome and the environment at the epigenetic level. - explain biochemical methods to study epigenetic processes.
Course contents	- epigenetics - genome & epigenome - biochemical methods in epigenetics
Prerequisites	Molekularbiologie und Mikrobiologie, Umweltmedizin 1, Umweltbiologie
Assessment Methods	- Final exam (75%) - Seminars & collaboration (25%)
Recommended Reading and Material	- scripts and literature provided via moodle
Attendance	Attendance of at least 75% is mandatory, if more than 25% of the units are missed, the first exam entry will be lost.
Comments	

Lab Course in Ecotoxicology Part2

Degree programme	MUT
Semester	2
Course methods	LAB
Language	German
ECTS Credits	3.00
Incoming places	Limited

Course description	In this course, students learn the practical use of ecotoxicological test systems at different trophic levels and how to proceed according to standardized methods.
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Teaching methods	Laboratory
Learning outcome	<p>After successful completion, students will be able to ...</p> <ul style="list-style-type: none"> - perform ecotoxicological tests independently. - determine acute toxicity with test systems of different trophic levels following OECD guidelines. - describe modes of action of selected contaminants on test organisms. - establish dose-response curves. - select the correct test system for a given problem. - write test reports according to the IMRAD structure.
Course contents	<ul style="list-style-type: none"> - Performance of ecotoxicological standard tests - Analysis and evaluation of concrete questions - Protocol management and writing of test reports
Prerequisites	General Chemistry (with laboratory), Molecular Biology and Microbiology, Ecotoxicology Lab 1.
Assessment Methods	- LV-Immanent performance assessment, protocols, group discussion, module examination.
Recommended Reading and Material	<ul style="list-style-type: none"> - Fomin, A. / Oehlmann, J. (2003): Praktikum zur Ökotoxikologie, ecomed - Fent, K. (2013): Ökotoxikologie, Thieme Verlag - Newman, M. (2014): Fundamentals of Ecotoxicology, Taylor & Francis Inc.
Attendance	Complete attendance is desired, in case of missing an appointment or a substitute work is possible, max 25% may be missed.
Comments	