ENGLISH COURSES

WINTER SEMESTER 2021/22

UNIVERSITY OF APPLIED SCIENCES UPPER AUSTRIA

HAGENBERG CAMPUS

General

Bachelor

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Language Course

German Courses

German 1

Course Unit Code	Type of Course Unit	ECTS- Credits
DEU1	Integrated Course	2

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Bettina Buchberger	Written exam, home-work, attendance	Face to Face

Prerequisites

Course contents

Acquisition of basic German for everyday life (greeting, introducing oneself and getting into contact with others, shopping,...); development of communication skills and intercultural competence

Basic knowledge of the German language and the Austrian culture; ability to use German in simple everyday situations

Interactive learning methods, team- and group activities
basic knowledge of the German language and the Austrian culture; ability to use German in simple everyday situations

What students say about this course: “This course was excellent and not really technical. Learn German from zero. Go to the course if you want to learn the new language!”

Recommended or required reading

Dictionary

German 2

Course Unit Code	Type of Course Unit	ECTS- Credits
DEU2	Integrated Course	1,5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Bettina Buchberger	Written Exam, home-work, attendance	Face to Face

Prerequisites

started some German but did not reach A1 yet

Course contents

Use of German in different situations of everyday life and work; development of communication skills in the target language and intercultural competence

Interactive learning methods, team- and group activities

Knowledge of the German language in everyday life and the Austrian culture

Recommended or required reading

Dictionary

German 3

Course Unit Code	Type of Course Unit	ECTS- Credits
DEU3	Integrated Course	1,5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Bettina Buchberger	Written Exam, home-work, attendance	Face to Face

Prerequisites

A2 or higher

Course contents

Use of German in different situations of everyday life and work; development of communication skills in the target language and intercultural competence

Interactive learning methods, team- and group activities

Knowledge of the German language in everyday life and the Austrian culture

Recommended or required reading

Dictionary

General Courses

Cross Cultural Entrepreneurship

Course Unit Code	Type of Course Unit	ECTS- Credits
	Integrated Course	2

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Gerold Weisz Ahu Genis-Gruber		Face to Face

Prerequisites

Course contents

For an effective entrepreneurial and organizational management, the analysis of recent developments and trends within hypercompetitive global arena will be carried out in the classes through text and case studies. The expanding Startup Commuinty among the geographies, and rapidly growing economies requires new management applications and entrepreneurial spirit. Entrepreneurship-, Startup- and Cross Cultural Management Strategies will be evaluated in the context of global changes and the development of future markets.

Topics: Entrepreneurial Spirit, Thinking and Behaviour, Economical and technical trends and developments within competitive markets, Cultural and entrepreneurial differences and their boundaries, Early Stage Marketing, Business Modelling and Business Planning for Startups, ...

Recommended or required reading

Automotive Computing

AC

https://www.fh-ooe.at/en/hagenberg-campus/studiengaenge/bachelor/automotive-computing/

A revolution is currently taking place in the automotive sector before our very eyes. In addition to new drive systems, it is above all digitalization that is becoming increasingly important, both in the vehicle itself and in the surrounding road infrastructure. Innovative IT solutions allow vehicles to communicate both with each other and with their environment, thus opening up countless possibilities for making future mobility safer, more environmentally friendly and more efficient.

Technologies like these include intelligent assistance systems, self-driving cars and systems for networking road users with their environment, but also mobility-based services (e.g. UBER) will fundamentally change our understanding of mobility in the coming years.

The degree program Automotive Computing trains experts for precisely these, still very young, specialist areas. The rapid development of the industry already requires specialists who understand the interplay between information technology and mobility, who can apply this optimally and thus help to shape our future sustainably.

Algorithms and Data Structures

Course Unit Code	Type of Course Unit	ECTS- Credits
ALD	Integrated Course	5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Marc Kurz	Written exam, exercise sheets	Face to Face

Prerequisites

The students know the most important formal and practical foundations of computer science, such as the targeted selection and evaluation of data structures, design and specification of algorithms, standard algorithms and introduction to complexity analysis.

Course contents

Focus on algorithms and data structures. Specification of algorithms; Complex dynamic data structures (trees, graphs), standard algorithms (search, sorting, dynamic search trees, hashing methods), iterative methods (conversion of sum expressions), recursive algorithms, elementary graph algorithms, calculation models and complexity measures. In the area of concrete applications, data formats for geodata (OGC SFS, GDF, ...) are treated as well as path data-graphs and routing algorithms.

Recommended or required reading

Aho A.V., Hopcroft J.E., Ullman J.D.: The Design and Analy- sis of Computer Algorithms. Addison-Wesley, 1974
Aho A.V., Hopcroft J.E., Ullman J.D.: Data Structures and Algorithms. Addison-Wesley, 1983
Horowitz E., Sahni S.: Fundamentals of Computer Algo- rithms. Pitman, London, 1979
Knuth D.E.: The Art of Computer Programming. Band 1: Fundamental Algorithms, Band 2: Seminumerical Algorithms, Vol. 3: Sorting and Searching. Addison-Wesley, 1973
Nievergelt J., Hinrichs K.H.: Algorithms and Data Structures. Prentice-Hall, 1993
Ottmann Th., Widmayer P.: Algorithmen und Datenstruktu- ren. Bibliographisches Institut, 1990
Sedgewick R.: Algorithmen. Addison-Wesley, 1992
Wirth Niklaus: Systematisches Programmieren. Teubner Studienbücher Informatik, 1978
Wirth Niklaus.: Algorithmen und Datenstrukturen. Teubner Studienbücher Informatik, 1986

Communication and Knowledge Media

KWM

https://www.fh-ooe.at/en/hagenberg-campus/studiengaenge/bachelor/communication-and-knowledge-media/

The Internet in all its facets offers a variety of possibilities and opportunities, be it in terms of communication, collaboration, network or further education – independent of time and location. As a marketplace for information, innovation, services, and products, the Internet has become an integral part of modern economies and societies. Consequently, and in view of ever-growing digitalisation efforts, we are facing numerous apps, platforms and social networks, with new ones emerging every day.

To stay successful in an increasingly digital future, companies and organisations have to meet these new challenges. Therefore, they depend on experts, who are not only proficient in technology, but master skills that go way beyond technical expertise. Such experts are able to understand and actively shape communication, learning and working processes.

Graduates from this study programme are characterised by exactly these qualifications. Their training consists of competences from both social and computer sciences – a unique combination complemented by generic skills such as communication, cooperation, problem solving, project management, and design thinking. This set of abilities enables them to approach new media holistically and promote communication and knowledge transfer within the digital world.

English 1

Course Unit Code	Type of Course Unit	ECTS- Credits
ENG1	Integrated Course	1

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Annamaria Mähr	Written exam, exercise sheets	Face to Face

Prerequisites

Course contents

Recommended or required reading

Note: Maximum 2 students can take this course! First come, first served!

English 3

Course Unit Code	Type of Course Unit	ECTS- Credits
ENG3	Integrated Course	1

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Annamaria Mähr	Written exam, exercise sheets	Face to Face

Prerequisites

Course contents

What students say about this course: “This course was excellent, the professor is very cool and interesting. I liked it even more than English Communication.”

Recommended or required reading

Note: Maximum 2 students can take this course! First come, first served!

Interaction Design

Course Unit Code	Type of Course Unit	ECTS- Credits
IXD3	Integrated Course	1

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Thomas Neumayr	Final exam	Face to Face

Prerequisites

Course contents

The usability and user experience of many interactive products (e.g. websites, apps, entertainment devices, smart homes, …) could be substantially improved if the creators of such technologies would think more about their users' actual needs, goals, and skills. Therefore, the course KWM250 Interaction Design is concerned with the user-centered design of user interfaces for interactive products. Students learn how to apply a user-centered design process to design, prototype, and test new user interfaces together with test users. The course teaches important methods from usability engineering and interaction design such as user observation, requirements analysis, using personas and scenarios, sketching, wireframes, prototyping, usability testing, etc. To pass the course, students have to succeed in the theoretical and the practical part. The theoretical part consists of lectures about usability, user experience, human-computer interaction and user-centered design methods. In the practical part, teams of 2-4 students apply this knowledge in a semester team project during which they design, build, and evaluate a user interface prototype.

What students say about this course:
"This course was excellent and quite technical. You will get the techniques for designing websites and games. "
"That course is better described as Human-Machine Interaction. The subject areas of usability and interaction design are dealt with, whereby the main aim is to design interactive products like websites, mobile applications, or even new devices."

Recommended or required reading

Mobile App Development

Course Unit Code	Type of Course Unit	ECTS- Credits
MAD	Integrated Course	2,5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Riegler Andreas, Schönböck Johannes	group work/project & project presentation	Face to Face

Prerequisites

Course contents

Creating an app an presenting it at the end of the semester. Assessment criteria: ideas, creativity and design of the app, approach (for example: why native app), realisation of the original idea, use of the platform, usability of the app on a mobile device, theoretical questions about the used concepts

Differences of mobile, hybrid and native apps; native apps - native development / Android; Mobile web apps – responsive design, PWAs (Service Worker, App Manifest); up-to-date JS APIs; insight to Frameworks (Angular, React Native, Native Scripts); Hybride Web Apps; strategies for development, testing of mobile apps, deployment. After some theory we are going to see many practical examples (APIs, frameworks, libraries) and how to use them for our apps.

Recommended or required reading

UX Design and Information Visualization

Course Unit Code	Type of Course Unit	ECTS- Credits
UXI	Integrated Course	2,5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Franziska Tachtler, Thomas Neumayr	Project presentation, term paper	Face to Face

Prerequisites

Course contents

Methods of user experience and interaction design, developments in human-computer interaction. Choosing and working on a project, collecting and analyzing data, working on the term paper

Recommended or required reading

Richard Harper, Tom Rodden, Yvonne Rogers, and Abigail Sellen. 2008. Being Human: Human-Computer Interaction in the Year 2020. Microsoft Research Ltd., Cambridge. https://hxd.research.microsoft.com/work/being-human-human-computer-interaction-in-the-year-2020.php
Löwgren, J., & Stolterman, E. (2004). Thoughtful interaction design: A design perspective on information technology. Mit Press. Suchman, L. A. (1987). Harrison, S., Tatar, D., & Sengers, P. (2007, April). Saffer, D. (2010).
Designing for interaction: creating innovative applications and devices. New Riders. http://www.sylviafredriksson.net/PCA/CD/IM2016/documents/readings/DSaffer_C1.pdf
The three paradigms of HCI. In Alt. Chi. Session at the SIGCHI Conference on human factors in computing systems San Jose, California, USA (pp. 1-18).
Bødker, S. (2015). Third-wave HCI, 10 years later---participation and sharing. interactions, 22(5), 24-31. https://interactions.acm.org/archive/view/september-october-2015/third-wave-hci-10-years-later-participation-and-sharing

Hardware-Software-Design

HSD

https://www.fh-ooe.at/en/hagenberg-campus/studiengaenge/bachelor/hardware-software-design/

What do smartphones, modern cars and robots have in common? They are ’smart‘ thanks to in-built computer technology that delivers functions once considered the stuff of sci-fi movies. Such smart computers depend on the perfect combination of dedicated software and hardware. This key symbiosis is the chief focus of our degree programme in Hardware-Software-Design. This full-time degree programme offers a thorough grounding in informatics, IT and electronics. Students will develop competence in the design and creation of embedded systems, software application and chip design.

Introduction to Artificial Intelligence

Course Unit Code	Type of Course Unit	ECTS- Credits
EKI5	Integrated Course	2.5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Dietmar Millinger		Face to Face

Prerequisites

This class requires basic understanding in computer programming and mathematics. Basic knowledge in Python is preferrable but not mandatory.

Course contents

The goal of the class is to provide actionable knowledge about the basic principles and structures as well as functions of AI systems und subsystems. This class has a focus on machine learning. With this knowledge the student shall be able to select and integrate AI modules into larger software systems. Therefore the students learn about a number of common AI modules, their functions and their interfaces. A special focus lies in the lifecycle of machine learning projects from proof of concept to production situations and the use of frameworks in production projects. In the practical part 4 examples in python on jupyter are implemented and strategies for improvement of the results are developed.

A student's description of the course:
"In this class, we learnt about state-of-the-art AI and machine learning technologies. This enables engineers to solve typical machine learning tasks by selecting suitable ML methods, interconnect them, prepare date, train models and evaluate the results quality. The course had 4 practical exercises that covered different tasks of the machine training process and introduced different machine learning algorithms implemented by technologies like Python Pandas and numPy on Jupyter notebooks. The lectures and the exercises covered topics like Regression, classification, Neural networks, Loss functions, Convolutional networks, LSTMs and GRUs, Autoencoders and Reinforcement Learning. In addition, to data cleansing and features extraction."

Recommended or required reading

Note: Elective Course - Only offered if enough students register.

Media Technology and Design

MTD

https://www.fh-ooe.at/en/hagenberg-campus/studiengaenge/bachelor/media-technology-and-design/

Exploiting the unlimited opportunities in the field of digital media requires mastery of creative design, smart contents, and fluency with the latest technology. This unique, full-time degree programme provides you with the technical expertise as well as the design and communication skills to take on any challenge in your chosen area – be it on the Web, in multimedia, 3D modelling, animation, computer games, audio & video production, or cross-publishing. You will acquire a solid grounding in the theory and practice of digital media. Hands-on experience with professional equipment will provide you with the technical and creative skills for implementing innovative and exciting media projects.

Media Studies

Course Unit Code	Type of Course Unit	ECTS- Credits
MTD170	Integrated Course	5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Jeremiah Diephuis	Oral or written exam	Face to Face

Prerequisites

Course contents

Communicative English in the context of Media Studies. Students gain insight into the historical developments and critical issues concerning the major forms of media: newspapers, radio, television and the World Wide Web.

Recommended or required reading

Project Incoming Students

Course Unit Code	Type of Course Unit	ECTS- Credits
MTD290A	Project	6

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Coordinator: Martin Harrer		Face to Face

Prerequisites

Course contents

Projects cover any number of topics within the field of Media, both technical- and design-oriented. Generally the student will propose a topic to the faculty of which they would like to cover. These topics generally fall somewhere in the spectrum of Game, Web, Audio/Video and Animation design/development. Some examples of technologies that might be used, depending on the project, are Java, Unity, LibGdx, Adobe Creative Cloud, PHP, HTML, and JavaScript. Each project differs, so it depends which particular skills and technologies the student wishes to improve or pick up. A couple examples of projects from past students include:

- Creating a puzzle game in which the main character finds herself lost in fictional universes.
- Creating a simple rhythm-based music game
- Developing a strategy game (Group of 3 people—2 focusing on art/graphics, 1 on sounds, visual, and programming) http://hive-21.com/
- Building a website which allows users to share a sort of “diary” of development projects and receive feedback from the community
- Making a music video for a local band
- 2D/3D Animation
- Short films

Recommended or required reading

Stop Motion Animation

Course Unit Code	Type of Course Unit	ECTS- Credits
MTD352	Integrated Course	4.5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Rauscher Remo & Jürgen Hagler	Project	Face to Face

Prerequisites

Students need to apply with a portfolio (online or pdf, youtube/vimeo links).
Images: jpg, png, tiff, ...). Movies: (mov, avi, mpg, ….).

Course contents

Workflow, principles and language of related analogue animation techniques: Stop Motion, Clay Animation, Cut Out, Cartoon Animation, Rotoscoping.

Recommended or required reading

Audio Processing

Course Unit Code	Type of Course Unit	ECTS- Credits
MTD370	Integrated Course	4.5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Christoph Schaufler	Exercises, Course-project	Face to Face

Prerequisites

audio processing fundamentals: operation of a modern digital audio workstation (Apple Logic, Steinberg Cubase, Avid ProTools, or the like) audio editing techniques, post processing (spectrum: equalisation/filters/ etc, dynamic: gate/compression/etc., effects: frequency- and time-based effects/reverb/etc),
programming fundamentals: knowledge of boolean / logic operations & basic programming skills
analytical thinking and methodical procedure when tackling problems

Course contents

Fundamentals of processing digital audio signals in both theory and practice. Specification and implementation of filters. Development environment with support for audio development. Simulation of the effect of basic algorithms from the field of synthesis and development of customized audio plug-ins (eg Max / MSP / Jitter).

Recommended or required reading

Andy Farrell, Designing Sound, 2010
K. C. Pohlmann, Principles of Digital Audio McGraw- Hill 2005; S. W. Smith, The Scientist and Engineer's Guide to DSP Programming

Web Applications

Course Unit Code	Type of Course Unit	ECTS- Credits
MTD380	Integrated Course	4.5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Rimbert Rudisch-Sommer	Class-based activities	Face to Face

Prerequisites

Foundations in Web App & DB Development (HTML/CSS, JavaScript, PHP, SQL)

Course contents

Introduction to serverside JavaScript- and PHP-based frameworks (node.js/Express, Symfony) and development workflows to build web applications and REST backends. Foundations of SQL based object-relational mapping (ORM) libraries (Doctrine ORM) and using document databases (MongoDB) for managing/ publishing structured data.

Recommended or required reading

Perry, Servlet and JSP Cookbook. O'Reilly, 2004. Johnson et al., Professional Java Development with the Spring Framework. Wiley & Sons, 2005

Mobile Computing

MC

https://www.fh-ooe.at/en/hagenberg-campus/studiengaenge/bachelor/mobile-computing/

It is obvious that smartphones and other mobile devices have become an integral part of our daily lives, enabling us to stay in touch with the digital world no matter when or where. However, the underlying technologies usually stay hidden for the users. What counts is the user experience (UX): Are the applications comprehensible and easy to use? Do they run stably? What happens in the case of a weak internet connection?

At the same time, our devices are getting more powerful. The increasing number of sensors, interfaces and specialized processors open up unprecedented possibilities for many different areas, such as Artificial Intelligence, Mobile Health and Games to mention just a few.

Students of Mobile Computing acquire in-depth knowledge of communications technology, informatics and programming. Special focus is put on application development for mobile devices.

Project 3: Introduction to System Engeneering

Course Unit Code	Type of Course Unit	ECTS- Credits
PRO3	Integrated Course	5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Coordinator: Marc Kurz	Oral Presentation	Face to Face

Prerequisites

Course contents

A modern and practical education is very important for us. Not only that enterprises value this fact, but also students often found a company themselves after or even already during their studies. Projects are therefore a good chance to implement their own ideas as well as to carry out interesting R&D projects and cooperations with companies.
When doing projects, students run through all steps of planning and implementing projects. This is the reason why not only the realization of the project but also techniques of project management for a smooth working process in the team as well as tools for a flawless technical implementation are taught and learned.

Overview of projects from past years is available here:
https://www.fh-ooe.at/campus-hagenberg/studiengaenge/bachelor/mobile-computing/projekte-praktika/studienprojekte/

Recommended or required reading

Mobile Sports

Course Unit Code	Type of Course Unit	ECTS- Credits
MOS	Integrated Course	5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Stephan Selinger	Excercises, project & project presentation	Face to Face

Prerequisites

Object-oriented programming in Java and C++
Mobile device programming (Android, iOS, ...)
Embedded systems programming, Introduction to signal processing

Course contents

The lectures show the basics, methods, algorithms and techniques needed to successfully participate in the development of such systems. Accompanying the theory parts (see the list below), we are going to develop an app, so that at the end of the course we will have a fully functional system.

Course content:

- Introduction (definitions, example systems, ...)
- Mobile sports for health
- Mathematical and physical foundations (classification, clustering, regression, kinematics, force and motion, work and energy, power)
- Principles of exercise training
- Exercise and work physiology
- Applications of heart-rate monitoring, energy expenditure, respiration rate
- Speed and distance devices
- Power meters
- Technology for mobile sports applications (ANT, 802.15.4, BT LE, Garmin Connect IQ)
- Applications of machine learning

Recommended or required reading

Mobile Games

Course Unit Code	Type of Course Unit	ECTS- Credits
MOG	Integrated Course	5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Christian Bartsch	Semester project & project presentation	Face to Face

Prerequisites

Course contents

Technical topics about development of mobile games with a game engine. Students develop their own games as a semester project in groups of 2, the project submission and presentation determine the final grade.

Recommended or required reading

Software Development for Android

Bachelor
MC

Course Unit Code	Type of Course Unit	ECTS- Credits
SEA	Integrated Course	5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Jens Krösche	Exercises, project & project presentation	Face to Face

Prerequisites

Basic programming knowledge in e.g. Java or Kotlin, knowledge of Object-Oriented Programming

Course contents

Beginner Android Development course covering the basics of Android development.

Project:
Choose a project topic as soon as possible, briefly discuss it with me and then start implementing. Keep in mind that project presentations are held on the last lecture day, hand in your project before that date.

For the presentation & project guidelines, have a look at the introduction slides.
Only one team member needs to hand in the project (properly naming all participants) - projects handed in late will not be graded.

Exercises:
All exercises are graded and have to be completed successfully in order to pass the course - hand in your exercises as a .zip file before the provided deadlines.

Recommended or required reading

1. Darcey, L. and Conder, S.: Android Wireless Application Development Volume I/II. Addison-Wesley Professional 2012.
2. Künneth, T.: Android 5: Apps entwickeln mit Android Studio. Reinwerk Computing 2015.
3. Post, U: Spieleprogrammierung mit Android Studio: Programmierung, Grafik & 3D, Sound, Special Effects. Galileo Computing 2014.
4. http://developer.android.com/index.html

Note: SEA, SEI and ADA all take place at the same time, therefore please choose just one of these courses!

Distributed Information Systems

Course Unit Code	Type of Course Unit	ECTS- Credits
VIS	Integrated Course	5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Jens Krösche	Final Exam, Exercises	Face to Face

Prerequisites

good Java programing skills
decent C++ programing skills

Course contents

- theoretical foundations of “distributed systems”
- basic practical knowledge about client / server communication via TCP / UDP sockets (C ++ / Java) and the use of threads, taking the corresponding synchronization mechanisms into account
- Java RMI
- Java-based SOAP / REST APIs
- fundamentals in the area of frameworks and component-oriented software development

A student’s description of the course:
“Various aspects of distributed information systems were addressed in this course. The main focus of the course was to implement applications that consist of different parts that are also distributed across different locations but can still communicate and share information between each other. A theoretical introduction was given to explain why this type of applications exist and how they are monitored and maintained. The course introduced 3 heavy exercises, where each exercise represents a whole independent application. In particular, topics like communication over sockets programming, using different versions of IPs and protocols were discussed. Also, Remote Method Invocation (RMI) and how to implement proper synchronization between different nodes and within an single node was addressed. In addition, The course introduced simple HTTP servers and Java Servlets and how to deploy them over a network. Web services as SOAP and REST APIs were implemented in the exercises after studying about data exchange formats like XML and JSON.”

Recommended or required reading

Wilde E.: Wilde’s WWW: Technical Foundations of the World Wide Web. Springer Verlag 1998.
Musciano C., Kennedy B.: HTML and XHTML: The Definitive Guide. O’Reilly 2006.
Flanagan D.: JavaScript: The Definite Guide. O’Reilly 2006.
Harold E.R., Means W. S.: XML in a Nutshell. O’Reilly 2004.
Jones M. Tim: BSD Sockets Programming from a Multi-Language Persprective. Charles River Media (Programming Series) 2004.
Tannenbaum Andrew S., van Stehen Marten: Verteilte Systeme - Grundlagen und Paradigmen. Pearson Studium 2006
Hammerschall Ulrike: Verteilte Systeme und Anwendungen; Architekturkonzepte, Standards und Middleware-Technologien. Pearson Studium 2005.
Mahlmann, P. und Schindelhauer, C.: P2P Netzwerke: Algorith- men und Methoden, Springer 2007.
Saint-Andre, P. u.a.: XMPP: The Definitive Guide: Building Real- Time Applications with Jabber Technologies. O’Reilly 2009.
Reussner, R. und Hasselbrink, W.: Handbuch der Software-Archi- tektur. dpunkt.verlag 2008.
Szyperski, C. u.a.: Component Software: Beyond Object-Oriented Programming, Second Edition. Addison-Wesley 2002.

Secure Information Systems

SIB

https://www.fh-ooe.at/en/hagenberg-campus/studiengaenge/bachelor/secure-information-systems/

The exchange of information, just like the amount of data and its accessibility anywhere, anytime, is matched by the exponential growth in modern technology. Experts qualified to meet the challenges of cybercrime, hacking and data theft are in increasing demand. This full-time degree programme will equip you to meet this demand, with its focus on full spectrum security protocols associated with the operation of computer systems and networks as well as mainstream data transfer, storage and archiving. Compulsory elective modules will give students the opportunity to further specialise in network, data and systems security.

English 1

Course Unit Code	Type of Course Unit	ECTS- Credits
ENG1	Integrated Course	2

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Irdonka Kretzschmar	Oral and Written Examination	Face to Face

Prerequisites

Course contents

The aim of this course is to revise grammar structures, expand vocabulary and foster presentation skills and fluency in the target language. Additionally special emphasis will be set on speaking skills, expressing of opinion and debating.

Recommended or required reading

Seminar 3

Course Unit Code	Type of Course Unit	ECTS- Credits
SEM3	Integrated Course	2

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Marcus Nohlberg		Face to Face

Prerequisites

Course contents

The BSc lectures will cover the theme “Champions of Today’s Digital World” and will tackle three challenging areas of information security:

PII and Cloud - *this lecture considers the issue of personally indentifiable information (PII) residing in the Cloud and the risks to this information and what protection can be used to reduce and manage these risks.*

IOT Security - the Internet of Things involves trillions small devices connecting and talking to each other in ‘smart ways’ to do ‘smart things’. But like all applications of the Internet security and privacy are top priority issues - this lecture covers some of these issues.

Social Networking Security Risks - there is widespread private and commercial use being made of social networking and such use brings with it the problems of security and privacy. Examples are social engineering, identity theft, data leakage through to potential damage to image and reputation.

Recommended or required reading

Note: Limited places (4) - An early registration is necessary.

Software Engineering

SE

https://www.fh-ooe.at/en/hagenberg-campus/studiengaenge/bachelor/software-engineering/

Software is at the heart of information technology (IT), and all applications – whether for mobile phones, PCs or even modern cars – depend on instructions based on specially written programmes. This Bachelor’s degree programme provides a thorough grounding in the theory and practice of sophisticated software development, including relevant tools, methodologies, and teamwork and networking skills. Graduates will be equipped to not only develop but also implement, evaluate and adapt software at the cutting edge of all areas of application. After their first year, full-time students can choose between two key areas in which to specialise: Business Software or Web Engineering. Part-time students specialise in Web Engineering.

Parallel and Distributed Software Systems

Course Unit Code	Type of Course Unit	ECTS- Credits
VPS5	Integrated Course	2

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Stefan Wagner	Written exam, exercise sheet	Face to Face

Prerequisites

For taking this course, you should know that you
- will have to participate in all lectures
- will have to do exercises at home
- will have to have a good knowledge of C# programming

Course contents

This lecture concentrates on the development of multi-threaded applications using the Microsoft .NET framework. Apart from a theoretical introduction into parallel programming and an overview of different hardware architectures, different APIs, synchronization and patterns are discussed. In the exercises the theoretical knowledge is applied in several practical examples (e.g., parallel Mandelbrot set generator, parallel Water World simulation).

A student's description of the course:
"This course discussed Programming of Parallel Applications and Shared-Memory systems. The course started with the mathematical concepts behind parallel programming and explained how to calculate the speedup and the efficiency of algorithms with the help of Amdahl's law and Gustafson's law. Then, an introduction on parallelization concepts and how to use Threads to implement a proper asynchronous, concurrent, and parallel application. During the course we developed 5 practical exercises that covered different topics and asked the students to implement complex computations. Programming languages like C# and frameworks like .NET with libraries like .NET Task Parallel Library (TPL) and OpenMP for C++ were mainly used to implement the exercises."

Recommended or required reading

Data Science and Engineering

DSE

https://www.fh-ooe.at/campus-hagenberg/studiengaenge/master/data-science-und-engineering/

In 2017, the world was generating 2.7 billion gigabytes of data per day. And by 2020 forecasts say this figure could exceed 44 trillion gigabytes per year. This veritable flood of data harbours invaluable know-how that is just waiting to be accessed. Structuring the information, identifying patterns and applying the findings in a fast, efficient way is crucial for decision-making in a multitude of sectors ranging from biomedical research to finance and manufacturing. The curriculum of this Master’s degree focuses on various areas in data analytics and computer science, including statistical methods, machine learning, data mining and visualisation. Students also acquire expertise in their chosen pathway: biomedical data analytics or data analytics for marketing and production.

Computational Intelligence 2

Course Unit Code	Type of Course Unit	ECTS- Credits
2CO2V 2CO2U	Integrated Course	5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Stephan Winkler Karin Pröll		Face to Face

Prerequisites

Course contents

Supervised mache learning: artificial neural networks, deep learning, machine learning in image analysis, support vector machines, random forests, regression, classification, white box modeling by genetic programming, and a studies project at the end of the course.

Recommended or required reading

Note: This course can also be chosen from Bachelor students if they meet the prerequisites.

The main language of instruction is German, although some modules may be offered in English.

Computational Science

supervised/unsupervised learning, hypotheses feature selection conceptual learning, candidate elimination cross-validation, case-based reasoning, rule-based reasoning nearest neighbours, decision trees classifier systems, Artificial Neuronal Networks (classic & bayesian technique), Deep Learning, Support Vector Machines & Kernel Methods, Random forest regression/classification, Bayesian Networks und Clustering, Markov Chain Monte Carlo Sampling, exercises with WEKA, HeuristicLab and SPSS/Clementine.

Computational Intelligence 1
Multivariate Statistics
Numerical Methods
Advanced Scripting
Text Mining
Biomedical Data Analysis
Data Analysis Production
Cloud Computing
Computer Vision
Data Protection and Privacy
High Performance Computing
Big Data

Note: There is also a Big Data Course in the Software Engineering Master.

Digital Arts

DA

https://www.fh-ooe.at/en/hagenberg-campus/studiengaenge/master/digital-arts/

Design-orientated know-how and practical skills in computer animation, audio/video & games

This full-time Master’s degree programme builds on a student’s creative, design and technical skills with our production and design-orientated programme that focuses on computer animation, audio/video, and games. You will expand further your ability to perform innovative and professional work across the media production industry. Our degree programme also seeks to build project management skills and develop a systematic approach to conceptualising and leading media projects by focusing on practice-oriented project work modules that combine state-of-the-art theory and practice. Students can furthermore choose from a broad range of in-depth modules for further specialisation.

Note for applicants: The main language of tuition on this study programme is German, although some modules may be offered in English.

Generative and Interactive Arts

Course Unit Code	Type of Course Unit	ECTS- Credits
DA630	Integrated Course	4.5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Jürgen Hagler		Face to Face

Prerequisites

Basic knowledge in Digital Arts and Programming
Students need to apply with a portfolio (online or pdf, youtube/vimeo links).
Images: jpg, png, tiff, ...). Movies: (mov, avi, mpg, ….).

Course contents

The goal of the course is to provide students with a theoretical and practical understanding of interactive and generative art. The course begins with a theoretical introduction based on over 40 years of media art history from the Ars Electronica Archive. This insight provides a chronological and thematic overview of generative and interactive art.

Towards the end of the course, we will then increasingly focus on concrete projects, tools and algorithms. This is with the intention that the students themselves realize an interactive and/or generative visualization with Processing as a project in the Deep Space of the Ars Electronica Center.

Evaluation
20% Concept and presentation of the project for Deep Space
50% Implementation of the Deep Space project
30% Project documentation

Group work of 2 to 4 students with clear comprehensibility of the individual performance.

Recommended or required reading

Note: The course is not suitable for students with a purely technical focus.

Embedded Systems Design

ESD

https://www.fh-ooe.at/en/hagenberg-campus/studiengaenge/master/embedded-systems-design/

Embedded Systems are an integral part of many modern-day devices, from smartphones to cars and robots. Without them, there would also be no smart homes and smart cities. Developing those complex, integrated computers requires a broad set of skills: expertise in the development of hardware and software, sensors, and systems networking. Our full-time, interdisciplinary Master’s degree programme in Embedded Systems Design covers all those aspects. Students choose two of the following three specialisation pathways: System-on-Chip Design, Embedded Computing (Embedded Systems, Cyber-Physical Systems), and Systems & Signals. They will also be able to develop teamworking, leadership and project management skills, and select from a wide range of elective modules for further specialisation.

Distributed Realtime Systems

Course Unit Code	Type of Course Unit	ECTS- Credits
DRS3	Integrated Course	6

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Dietmar Millinger	Written exam	Face to Face

Prerequisites

Embedded Computer Systems
Programming language C
Communication Systems

Course contents

Distributed Systems and Time
Real-Time Communication and Execution
Architectures
Faults and Fault-Tolerance

The goal of the lecture is to acquire a model of distributed real/time systems which allows the student to understand project requirements for distributed real/time systems, design the architecture of hierarchical distributed real/time systems, select commercial of the shelf components for use in distributed real/time systems and understand key mechanisms for fault/tolerant distributed real/time systems.

Recommended or required reading

Text Book: Hermann Kopetz, Real-Time Systems – Design Principles for Distributed Embedded Applications, Kluwer 1997

Realtime Operating Systems

Course Unit Code	Type of Course Unit	ECTS- Credits
	Integrated Course	6

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
	Written Exam	Face to Face

Prerequisites

Course contents

Recommended or required reading

Note: Course tought in English only if internationals are applied, by default tought in German.

Advanced Methods of Verification

Course Unit Code	Type of Course Unit	ECTS- Credits
	Integrated Course	5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
	Written Exam	Face to Face

Prerequisites

Course contents

Recommended or required reading

Note: Course tought in English only if internationals are applied, by default tought in German.

Predictive Analytics for IoT

Course Unit Code	Type of Course Unit	ECTS- Credits
	Integrated Course	3

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
	Written Exam	Face to Face

Prerequisites

Course contents

Recommended or required reading

Note: Course tought in English only if internationals are applied, by default tought in German.

Functional Safety in Embedded Systems

Course Unit Code	Type of Course Unit	ECTS- Credits
	Integrated Course	3

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
	Written Exam	Face to Face

Prerequisites

Course contents

Recommended or required reading

Note: Course tought in English only if internationals are applied, by default tought in German.

Engergy Informatics

ENI

https://www.fh-ooe.at/en/hagenberg-campus/studiengaenge/master/energy-informatics/

Energy is the underlying heartbeat of the global economy – a critical factor in the production of nearly all goods and services in the modern world. Clearly, given the critical role of energy, the driving imperatives in any economy are ensuring security of supply, maintaining competitiveness and overseeing the transition to a low-carbon future.

Key requirements in this respect are the strategic management of supply and improving its overall generation and distribution. Impacting on these challenging goals will be a variety of factors, including advances in renewables, e-mobility and green technologies, to name only a few. Managing this changing environment is no easy task. That will require intelligent IT solutions and therefore well-educated IT experts able to design and/or operate future smart grids, smart city infrastructures and enhanced energy supply systems.

Energy Informatics is the application of information technologies to this highly demanding field and the focus of this English-taught Master's degree programme.

Physics

Course Unit Code	Type of Course Unit	ECTS- Credits
ENI401	Integrated Course	2

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Andreas Aichhorn	Oral or Written Examination	Face to Face

Prerequisites

Bachelor's degree or comparable higher education; at least 60 ECTS in Informatics and advanced programming skills (Java, C/C++)

Course contents

Fundamental definitions and units: DC and AC, current, voltage, resistor, impedance, energy and power.

Measurement technology: Fundamentals of measurements (electrical Power, electrical energy, temperature, light); measurement chain (sensor to data acquisition).

EMC: Physically principles of electromagnetically impacts; screening and coupling decreasing measures; source and sink considerations; filtering.

Measurement errors and accuracy: Error types (systematic, digitalization, random, ...); accuracy; resolution.

Data acquisition concepts

Filtering of data

Measurement amplifiers

Recommended or required reading

1. Charles A. Gross, Thaddeus A. Roppel, Fundamentals of Electrical Engineering, CRC Press, February 2012
2. Oleg D. Jefimenko, Electricity and Magnetism: An Introduction to the Theory of Electric and Magnetic Fields, Electret Scientific, September 1989
3. John G. Webster, Halit Eren, Measurement, Instrumentation, and Sensors Handbook, CRC Press, January 2014
4. Michael Grabe, Measurement Uncertainties in Science and Technology, Springer, May 2014
5. Henry W. Ott, Electromagnetic Compatibility Engineering, Wiley, August 2009
6. Allen J. Wood, Bruce F. Wollenberg, Gerald B. Sheblé, Power Gen-eration, Operation and Control, Wiley-Interscience, November 2013 7. Leonard L. Grigsby, Electric Power Generation, Transmission, and Distribution, CRC Press, May 2012

International Energy Markets and Energy Law

Course Unit Code	Type of Course Unit	ECTS- Credits
ENI402	Integrated Course	5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Werner Friedl	Oral or Written Examination	Face to Face

Prerequisites

Bachelor's degree or comparable higher education; at least 60 ECTS in Informatics and advanced programming skills (Java, C/C++)

Course contents

Energy and Climate Policy within the EU
The 2020 climate and energy package; the 2030 framework for climate and energy policies; liberalisation of the electricity and gas markets; promotion of the use of energy from renewable sources; energy efficiency directive; the EU emissions trading system; regulation on wholesale energy market integrity and transparency (REMIT); agency for the cooperation of energy regulators; network codes.
Smart Meter
Smart meter rollout recommendation (EU); smart grid task forces (EU); homologation/verification of meters (Non EU/EU/National).
Energy pricing with respect to examples like:
Whole sale trading market, stock exchange; classical energy utilization; domestic systems; island systems.
Microgrid systems Energy trading
Market places, products, hedging, …
Financial assessment
Overview on marketing and market development

Recommended or required reading

1. DIRECTIVE 2012/27/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC.
2. Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC
3. REGULATION (EC) No 713/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 July 2009 establishing an Agency for the Cooperation of Energy Regulators
4. Recommendation 2012/148 on preparations for smart metering roll-out Recommendation 2012/148 on preparations for smart metering roll-out: http://eur-lex.europa.eu/LexUriServ/LexUriS-erv.do?uri=CELEX:32012H0148:EN:NOT
5. Working Party 29 opinion 12/2011 on smart metering: http://ec.europa.eu/justice/policies/privacy/docs/wpdocs/2011/wp183_en.pdf
6. Smart Grid Task Force EG3 first year report 'options on handling smart grid data': http://ec.europa.eu/energy/gas_electricity/smart-grids/doc/xpert_group3_first_year_report.pdf
7. Smart Grid Task Force EG2 regulatory recommendations for data protection, privacy: http://ec.europa.eu/energy/gas_electricity/smart-grids/doc/expert_group2.pdf
8. Angus Johnston, Guy Block: EU Energy Law, OUP Oxford, 2012.
9. M. Roggenkamp, C. Redgwell, I. Del Guayo: Energy Law in Europe: National, EU, and International Regulation, Oxford Univ Pr., 2007.
10. Benth F.E., Kholodnyi V. A., Laurence P.: Quantitative Energy Finance, Springer 2014.
11. Ocana C.: Regluatory institutions in liberalised electricity markets: OECD 2001
12. Organization for Economic Co-operation and Development: Security of Gas Supply in Open Markets. OECD Publishing and International Energy Agency 2004

Processes and Process Modelling

Course Unit Code	Type of Course Unit	ECTS- Credits
ENI403	Integrated Course	5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Dagmar Auer Franz Fischer	Oral or Written Examination	Face to Face

Prerequisites

Bachelor's degree or comparable higher education; at least 60 ECTS in Informatics and advanced programming skills (Java, C/C++)

Course contents

Market roles and processes in a liberalized energy market
Supply contract management and related processes, such as start of supply, move-in and move-out and end of supply; grid usage contracting and billing; meter-reading services; master data distribution; energy settlement; process and communication monitoring; grid operator, supplier.

Business processes
Rollout process
Processes modelling
Methodologies, tools.

Recommended or required reading

1. Heinrich Seidlmeier: Prozessmodellierung mit ARIS®: Eine beispielorientierte Einführung für Studium und Praxis, Vieweg+Teubner Ver-lag, 2010.
2. Manuel Laguna, Johan Marklund: Business Process Modeling, Simulation and Design, CRC Press Inc., 2013.
3. Rick Sturm, Mary Jander, Wayne Morris: Foundations of Service Level Management, Sams Professional, 2000.Jakob Freund, Bernd Rücker: Real-Life BPMN: Using BPMN 2.0 to Analyze, Improve, and Automate Processes in Your Company, CreateSpace Independent Publishing Platform, 2014.
4. Christian Aichele et.al.: Smart Meter Rollout: Praxisleitfaden zur Ausbringung intelligenter Zähler, Springer Vieweg, 2012. Manuel Laguna, Johan Marklund: Business Process Modeling, Simulation and Design, Crc Pr Inc, 2013.

Systems Engineering I: Fundamentals

Course Unit Code	Type of Course Unit	ECTS- Credits
ENI404	Integrated Course	5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Stephan Selinger	Oral or Written Examination	Face to Face

Prerequisites

Bachelor's degree or comparable higher education; at least 60 ECTS in Informatics and advanced programming skills (Java, C/C++)

Course contents

Fundamentals of systems and software engineering; system development life cycle, life cycle management, agile and traditional processes and methods, unified process, scrum, XP, eclipse process framework project; requirements engineering, use cases;
software architectures; modeling structure and behavior in UML and SysML, UML style guidelines, language architecture of UML (Metamodel, meta object facility (MOF)),
XML metadata interchange format (XMI), UML profiles, object constraint language (OCL),
eclipse modeling framework (EMF), graphical modeling framework,
model-to-model transformation, model-to-text transformation, code generation,
Xtext and Xtend; model driven architecture,
domain specific languages and domain specific modeling;
software configuration management (SCM), defect tracking.

Recommended or required reading

1. G. Booch, J. Rumbaugh, I. Jacobson: The Unified Modeling Language User Guide. Second Edition. Addison Wesley. 2005.
2. J. Holt: UML for Systems Engineering: watching the wheels. Second Edition. Institution of Engineering and Technology. 2007
3. Object Management Group (OMG): Unified Modeling (OMG UML), Superstructure, Version 2.4.1. 2011.
4. Object Management Group (OMG): Unified Modeling (OMG UML), Infrastructure, Version 2.4.1. 2011
5. S. W. Ambler: The Elements of UML 2.0 Style. Cambridge University Press. 2005
6. J. Arlow, I. Neustadt: UML and the Unified Process. Practical Object-Oriented Analysis and Design. Addison-Wesley. 2002.
7. A. Cockburn: Writing Effective Use Cases. Addison-Wesley. 2001
8. I. Jacobson, G. Booch, J. Rumbaugh: The Unified Software Development Process. Addison-Wesley. 1999.
9. D. Steinberg, F. Budinsky, M. Paternostro, E. Merks: EMF: Eclipse Modeling Framework, Second Edition. Addison-Wesley 2009.
10. Object Management Group (OMG): MOF 2.0/XMI Mapping Specification, v2.1.1
11. Object Management Group (OMG): Object Constraint Language. Version 2.2. 2010.
12. J. Warmer, A. Kleppe. The Object Constraint Language: Getting Your Models Ready for MDA. Second Edition. Addison-Wesley. 2003. 13. R. C. Gronback: Eclipse Modeling Framework. A Domain-Specific Language Toolkit. Addison-Wesley. 2009.
14. L. Bettini: Implementing Domain-Specific Languages with Xtext and Xtend. Packt Publishing. 2013
15. K. S. Rubin: Essential Scrum. A Practical Guide to the Most Popular Agile Process. Addison-Wesley. 2012.
16. S. P. Berczuk: Software Configuration Management Patterns: Effective Teamwork, Practical Integration. Addison-Wesley. 2003

Energy Consumers

Course Unit Code	Type of Course Unit	ECTS- Credits
ENI406	Integrated Course	5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Wolfgang Stumpf	Participation, home-work, written exam	Face to Face

Prerequisites

Bachelor's degree or comparable higher education; interest in building energy systems, building services, energy consumers and Internet of things

Course contents

- Knowing and understanding the technology of the main energy consumers in industry, outdoors and buildings: lighting, heating, ventilation, cooling, pumps, drives, compressed air and their applications in energy systems
- Focus on building energy: state of the art and definitions, systems, components, characteristic values and standards, calculation of energy demands, concepts for reduced heating, cooling, ventilation, air conditioning and lighting consumption
- Automation concepts and energy saving potentials due to automation
- Creating the future: smart buildings / smart cities / smart grids
- Economic aspects and environmental impacts of energy efficient technologies and load flexibility

Recommended or required reading

Lechner, N.: Heating, Cooling, Lighting - Sustainable Design Methods for Architects. John Wiley & Sons Inc., New Jersey, 4th edition, 2015

Communication Technology

Course Unit Code	Type of Course Unit	ECTS- Credits
ENI501	Integrated Course	5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Armin Veichtlbauer	Oral or Written Examination	Face to Face

Prerequisites

Bachelor's degree or comparable higher education; at least 60 ECTS in Informatics and advanced programming skills (Java, C/C++)

Course contents

- Communication basics (terms, objectives, relevance for Smart Grid)
- Communication models (OSI Reference Model, TCP/IP)
- Signal Processing (Fourier analysis, analogue/digital conversion, coding)
- Modulation (pulse shapes, AM/FM/PM, complex modulation, spread spectrum)
- Medium access control (topologies, multiple access, stochastic MAC, Example: Aloha Network)
- Logical link control (error handling strategies, Hamming coding, CRC, Stop&Wait ARQ, Sliding Window ARQ)
- Network layer functionality (packet switching, link-state routing, distance-vector routing, QoS)
- Internet technologies (IPv4, IPv6, NAT, subnetting, MPLS, Internet organization)

Recommended or required reading

1. Andrew S. Tanenbaum, David J. Wetherall: Computer Networks - 5th Edition. Pearson, 2014.
2. James Kurose, Ross Keith: Computer Networking: A Top-Down Approach – 6th edition. Pearson, 2012.
3. Kenneth C. Budka, Jayant G. Deshpande, Marina Thottan: Communication Networks for Smart Grids: Making Smart Grid Real. Springer, 2014.
4. Ekram Hossain, Zhu Han, H. Vincent Poor: Smart Grid Communications and Networking. Cambridge University Press, 2012.
5. Stephen F. Bush: Smart Grid: Communication-Enabled Intelligence for the Electric Power Grid. John Wiley & Sons, 2014.
6. Erik Dahlman, Stefan Parkvall, Johan Skold, Per Beming: 3G Evolution: HSPA and LTE for Mobile Broadband. Academic Press, 2010.
7. Bernhard H. Walke: Mobile Radio Networks: Networking, Protocols and Traffic Performance. Wiley, 2001.
8. Haniph A. Latchman, Srinivas Katar, Larry Yonge, Sherman Gavett: Homeplug AV and IEEE 1901: A Handbook for PLC Designers and Users. Wiley, 2013.

Cloud Computing/Big Data

Course Unit Code	Type of Course Unit	ECTS- Credits
	Integrated Course	

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
	Oral or Written Examination	Face to Face

Prerequisites

Course contents

Basic principles of cloud computing (idea and motivation, opportunities and risks, application areas); architecture of cloud computing platforms (layer model for the classification of platforms, IaaS, PaaS, SaaS); architecture of cloud applications (tier architecture, AOP, stateful / stateless services, loose coupling, separation of concerns, asynchronous message processing); google app engine (architecture, memory models, task queues, integration of external services, security, programming model); microsoft windows azure (architecture, fault tolerance, programming model, memory services: blobs, tables , queues, SQL azure, windows azure service bus); amazon web services (architecture, EC2, SQS, SNS, S3, load balancing, VPC).

Recommended or required reading

Software Systems II: SCADA

Course Unit Code	Type of Course Unit	ECTS- Credits
ENI508	Integrated Course	5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Stephan Hutterer		Face to Face

Prerequisites

Course contents

- Power System Operation:
Supervisory control and data acquisition (SCADA); basics of power grid automation (typical functionality, real-time requirements, information flow); information architecture (CIM-reference model); protocols (IEC 61850, IEC 60870-5 standards, DNP3); deepened understanding of IEC 61850; existing software solutions and their features; power grid protection; IT security aspects in power grids.

- Power System Analysis:
Data analysis (weather forecast, load profiles and simultaneity of loads); basic simulation/computation/ analysis approaches used in power grid operation (load flow, short circuit); optimization and control of the grid (optimal power flow, load frequency control).

- Practical Part:
Application of selected SCADA and simulation too

Recommended or required reading

Java Advanced

Course Unit Code	Type of Course Unit	ECTS- Credits
ENI515	Integrated Course	5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Johannes Sametinger		Face to Face

Prerequisites

Course contents

Recommended or required reading

Note: Elective Course - Only offered if enough students register.

Scientific Working

Course Unit Code	Type of Course Unit	ECTS- Credits
ENI601	Seminar	1

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Rainhard Findling	Hand-ins, presentation	Face to Face

Prerequisites

Knowledge of using LaTeX to write documents, basic knowledge about usage of scientific reference management software like JabRef, previous completion of a thesis (e.g. Bachelor's thesis) which included reading scientific publications.

Course contents

Learning outcomes: after this course students will understand the scientific method, the peer reviewing process, and the organization of program committees and scientific conferences. The course furthermore facilitates improving scientific paper reading and writing skills, as well as improving scientific presentation skills.

Recommended or required reading

* How to Write Papers That Get Cited and Proposal That Get Funded, Joshua Shimel, Oxford Univ. Press, 2011
* The writer's handbook: https://writing.wisc.edu/Handbook/PlanResearchPaper.html

Human-Centered Computing

HCC

https://www.fh-ooe.at/en/hagenberg-campus/studiengaenge/master/human-centered-computing/

IT systems of the future will need to instinctively respond to user needs and competencies. This cutting-edge, part-time degree programme gives graduates of information technology studies the chance to refine their skills in developing more accessible and user-friendly technologies. The interdisciplinary curriculum draws primarily on social sciences and IT, including areas such as interaction design, natural-user interface development, image processing, as well as prototyping. Graduates will learn problemsolving and full-spectrum consultancy skills that are key to the conceptualisation and deployment of practical applications in this dynamic field.

Intercultural Negotiation

Course Unit Code	Type of Course Unit	ECTS- Credits
	Integrated Course	1.5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Martina Gaisch	Continuous Assessment and final test	Face to Face

Prerequisites

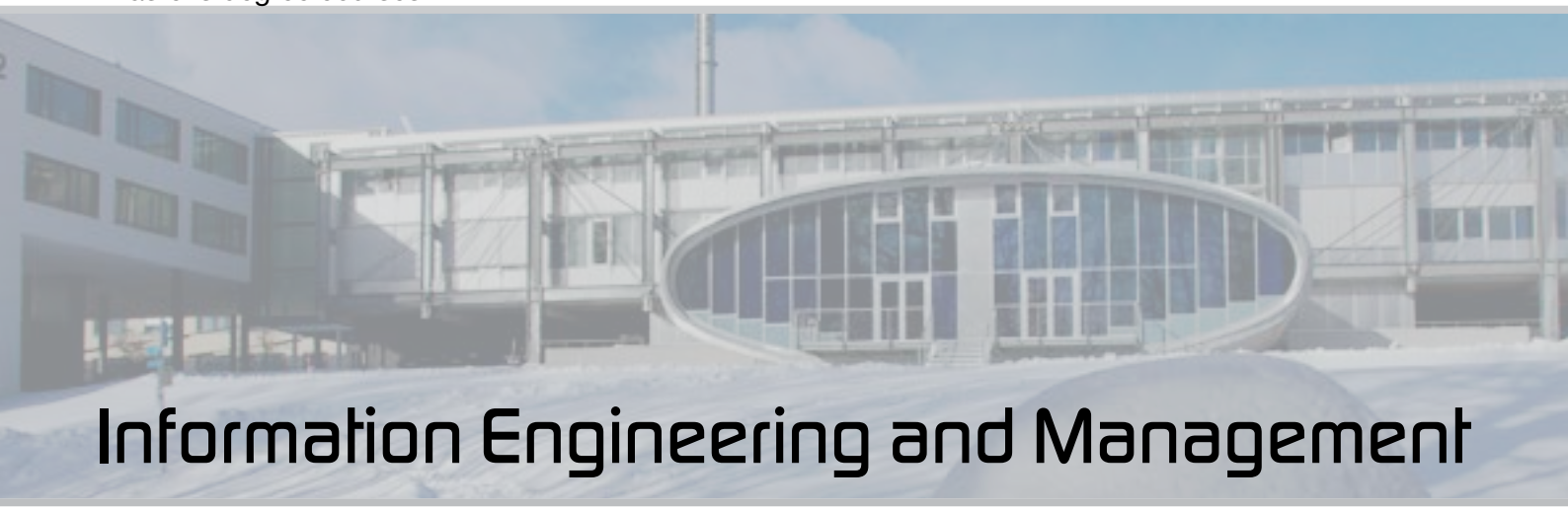
B2-level of English

Course contents

Intercultural theory (Hofstede, Hall, Trompenaars, Hampden-Turner, Schwartz, House et al, Lewis); global awareness and intercultural negotiation techniques.

Recommended or required reading

Hampden-Turner, C. /Trompenaars, F. (2001). Building Cross-Cultural Competence: How to Create Wealth from Conflicting Values
Nesbitt, R. (2003) The Geography of Thought: How Asians and Westerners Think Differently ... and Why
Schneider, S. / Barsoux, J. (2003). Managing cross Cultures
Hofstede, G. (2001). Culture's Consequences Comparing Values, Behaviors, Institutions, and Organizations Across Nations
Hall, E. (1990). Understanding Cultural Differences.
Schroll-Machl, S. (2003). Doing Business with the Germans: Their Perception, Our Perception. Vandenhoeck & Ruprecht GmbH KG.



Information Engineering and Management

IEM

https://www.fh-ooe.at/en/hagenberg-campus/studiengaenge/master/information-engineering-and-management/

The increasing complexity of information technology is making unceasing demands on data control and co-ordination. Planning, developing and implementing sophisticated systems to meet company targets is a serious challenge for IT managers. Access to data anywhere, anytime, common usage of information and user-friendliness are prime objectives. This requires experts with software development, business intelligence and analytical IT skills as well as know-how in management, law and team leadership. This part-time Master's degree programme equips students with exactly these skills and is particularly suitable for people with a first degree in information technology, who aim at taking up management positions in the IT business.

Note for applicants: The main language of tuition on this study programme is German, although some modules may be offered in English.

Business English Communication Skills

Course Unit Code	Type of Course Unit	ECTS- Credits
BEC3 T	Individual training	1

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Martina Gaisch		Face to Face

Prerequisites

Course contents

Simulations roleplay, group works, partner works, presentations and discussions to topics like:

- Working rights
- Knowledge Management
- Business Intelligence und Data Mining
- Learning in Data Engineering
- Data Warehousing- und OLAP-Techniken
- Organisation Planning
- Semantic Systems

...

Recommended or required reading

Intercultural Communication

Course Unit Code	Type of Course Unit	ECTS- Credits
ICC3 I	Integrated Course	2

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Martina Gaisch		Face to Face

Prerequisites

Course contents

- Theories and key concepts of Intercultural Communication - Processes of intercultural adaptation according to the stage model of Milton Bennett and based on Geert Hofstede
- Examples and experiences from practical applications
- Exercises for the further development of key competences
- Based on a case study in the field of international communication, a potential conflict is worked up

What students say about this course: “This course was excellent and quite technical “

Recommended or required reading

Information Security Management

ISM

https://www.fh-ooe.at/en/hagenberg-campus/studiengaenge/master/information-security-management/

Effective management strategies to deal with information security on a global scale
The ever-growing multiplication of diffuse data and IT systems pose serious security challenges which can only be addressed by a holistic approach to security management protocols. Likewise, applications in the area of social networks or cloud computing and 'always-on' technologies need to be increasingly taken into account when planning and implementing information and communications systems. This new, part-time Master's degree will provide students with the expertise to deploy the interdisciplinary approach that is a key element in formulating and implementing effective management strategies to deal with the imperatives of international information security on a global scale.

Note for applicants: The main language of tuition on this study programme is German, although some modules may be offered in English.

English 1

Course Unit Code	Type of Course Unit	ECTS- Credits
ISM15.1.LAN	Integrated Course	2

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Martina Gaisch	Continuous Assessment	Face to Face

Prerequisites

Participants need to have a sound level of English (at least B2) - both in written and oral discourse.

Course contents

This course aims at preparing participants for the Cambridge BEC higher certificate. Students get competencies in receptive and productive language skills.

The course is structured in ways that draw on all linguistic skills required for the BEC higher examination. Reading, writing, listening and speaking competencies are conveyed by providing sufficient course material to the students.

Two face-to-face modules provide the learners with the opportunity to clarify open questions but also to engage with their cohorts and practise speaking exercises. The rest will be conveyed via BigBlueButton to ensure an interactive and assisted teaching and learning.

Recommended or required reading

Note: This course can also be chosen from Bachelor students if they meet the prerequisites.
Note: This course already starts at the end of September.
Note: Limited places - An early registration is necessary.

Interactive Media

IM

https://www.fh-ooe.at/en/hagenberg-campus/studiengaenge/master/interactive-media/

The English-taught Master in Interactive Media offers a wide range of subjects focusing on the technology and engineering behind interactive media, computer games and cutting-edge online media. Graduates acquire the essential knowledge and professional skills necessary to take on innovative and complex projects in the media industry.

The programme features both a substantial project component and an extensive selection of specialized courses that couple theoretical concepts with practical experience at the highest level.

In addition to providing an industry-oriented education, the programme aims to develop graduates' communication skills and refine their systematic approaches to problem solving.

Software Design Methods

Course Unit Code	Type of Course Unit	ECTS- Credits
IM410	Integrated Course	4.5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Hans Prüller	Written Exam	Face to Face

Prerequisites

Course contents

Modern Software Architectures and Methods of System Design, Modeling- and Design-Patterns, Development Environments, Test-cases, Use-cases, Performance vs. Elegance.

Recommended or required reading

Note: Limited places - An early registration is necessary.

Advanced Computer Graphics

Course Unit Code	Type of Course Unit	ECTS- Credits
IM420	Integrated Course	6

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
David Schedl	homework and project	Face to Face

Prerequisites

Ability to read simple computer programs written in the C/C++ language and a basic knowledge of computer graphics concepts (for example, depth buffering, transformations etc.). No previous experience writing graphics applications is required.

Course contents

Students will learn the fundamental concepts of advanced computer graphics techniques. Topics include introduction in GPU programming, advanced shading and texturing techniques (e.g. parallax bump-mapping), photo-realistic (e.g. fire, smoke, skin shader) and non-photorealistic rendering (e.g. hatching, painterly renderer) techniques, shadow generation (shadow volumes, shadow mapping). Real-time rendering techniques (e.g. LOD, culling).

The course has 4 weekly units over 12 weeks, i.e., 48 units total. These are assigned as follows:
Lecture (12 x 2 = 24 units): The lectures mostly provide the theory and the background information.
Lab (12 x 2 = 24 units): In the lab sessions, we will work on small assignments to become familiar with the environment and the shader language. The exact format and contents of the lab units will be discussed in class. Lab attendance is mandatory.

Recommended or required reading

- OpenGL Shading Language, 3rd Edition, by Randi J. Rost, Bill Liceakane, et al.

- OpenGL 4 Shading Language Cookbook: Build high-quality, real-time 3D graphics with OpenGL, GLSL, and C++, 3rd Edition, by David Wolff

- Graphics Shaders: Theory and Practice, Second Edition, by Mike Bailey

Hypermedia Frameworks

Course Unit Code	Type of Course Unit	ECTS- Credits
IM430	Elective Course	6

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Rimbert Rudisch-Sommer	Exam	Face to Face

Prerequisites

Foundations in Web Development (HTML/CSS), Java, and Databases (SQL)

Course contents

Enterprise Java APIs (Servlets, JSP), Spring-Framework, Persistence Frameworks (Spring JDBC Template, MyBatis, Hibernate, JPA), Web Frameworks (Spring WebMVC, JSF), Tools/Methods for JEE Development (Maven, Jenkins).

Recommended or required reading

Game Architecture

Course Unit Code	Type of Course Unit	ECTS- Credits
IM440	Elective Course	6

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Roman Divotkey	Project work and exam	Face to Face

Prerequisites

Profound programming knowledge, basic knowledge of game programming

Course contents

Computer game genres, general software architecture of games and interactive applications, software design patterns, architectural pat-terns, related algorithms and data structures, representation of entities and states, real-time processing of events, game physics, game specific artificial intelligence, architecture an integration of middle ware components like physics, graphics, sound, logic and artificial intelligence, quality assurance in game development, performance considerations.

Recommended or required reading

Project 1

Course Unit Code	Type of Course Unit	ECTS- Credits
IM490	Elective Course	9

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Coordinator: Roman Divotkey	Project, presentation	Face to Face

Prerequisites

Course contents

Guided project work on topics provided by faculty members or proposed by the student. Working in teams (of size 1-3) is encouraged to foster project management and team collaboration skills. Each project is coached by at least one faculty member.

Recommended or required reading

Design for Physical Prototyping

Course Unit Code	Type of Course Unit	ECTS- Credits
IM601	Elective Course	4.5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Thomas Preindl	homework and project	Face to Face

Prerequisites

Ability to read simple computer programs written in the C/C++ language. No previous experience in electronics is required.

Course contents

Physical Prototyping is the process of making a physical representation of an idea. Early in the process physical prototypes can be made of all kinds of materials. Physical prototypes allow designers and users to interact with the idea. By building an idea, designers are challenged to “build to think” and thus gain deeper insights. This course will go beyond early physical prototyping: it is a hands-on introduction to interactive electronics prototyping for students with a variety of backgrounds, including those with no prior experience in electronics. Familiarity with programming is helpful, but not required. Participants learn basic electronics, microcontroller programming, and physical prototyping using the Arduino/ESP32 platform, then use digital and analog sensors, LED lights and motors to build, program and customize a smart prototype. Moreover, students will get enough theoretical background for developing their own physical prototypes The course will be done together with students from the Fashion & Technology department at the University of Arts. The final project will be about a smart textile interface.

The course has 3 weekly units over 12 weeks, i.e., 36 units total. These are assigned as follows:
Lecture (12 x 2 = 24 units): The lectures mostly provide the theory and the background information.
Lab (12 x 2 = 24 units): In the lab sessions, we will work on small assignments to become familiar with the topics. The exact format and contents of the lab units will be discussed in class.

Recommended or required reading

Make: Getting Started with Arduino by Massimo Banzi

Semantic Text Analysis

Course Unit Code	Type of Course Unit	ECTS- Credits
IM621	Elective Course	4.5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Andreas Stöckl	Homeworks/small projects	Face to Face

Prerequisites

Course contents

Essential components of many Web applications are methods for automatic text analysis. In this course, the (mathematical) foundations are taught to build such applications. Basic string processing methods as well as methods for cluster analysis, classification and categorization of texts are discussed. Important topics of the course are algorithms to identify objects in texts such as places, persons and other objects.

Basic and advanced techniques for text-based information systems: efficient text indexing; Boolean and vector space retrieval models; evaluation and interface issues; Web search including crawling, link-based algorithms, and Web metadata; text/Web clustering, classification; text mining.

Recommended or required reading

In-Game Technologies

Course Unit Code	Type of Course Unit	ECTS- Credits
IM645	Integrated Course	4.5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Roman Divotkey		Face to Face

Prerequisites

Course contents

Introduction to free-to-play (F2P) business model; concepts for game monetization, in-app purchases and the necessary adaptations to game design and mechanics as well as supporting technologies. Analytics, player metrics, AB testing, key performance indicators, rapid iterations. Supporting technologies: scripting, component-based development, data-driven development, user generated content, cellular automata, voxel engine, game data persistence, security considerations.

Recommended or required reading

Special Topic: Information Visualisation

Course Unit Code	Type of Course Unit	ECTS- Credits
IM646	Integrated Course	4.5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Doris Zachhuber Markus Wagner Alexander Rind	Project and presenta-tion	Face to Face

Prerequisites

Course contents

Graduates possess knowledge of the visualisation of complex and large-scale content. They are able to implement technically demanding multimedia applications; this concerns conceptual, design and technical competences. They have the skills to analyze complex multi-dimensional data sets, to structure and to convert it into an visual structure for the particular application. They learn to use visual design elements incl. animation and inter-activity specifically to present information clearly and concisely.

- Principles of informaion- and data visualisation
- Concepts for concise and expressive representation of complex information.
- Application of color, space, animation and interactivity in visualisation.

Recommended or required reading

Note: Elective Course - Only offered if enough students register.

Academic Writing

Course Unit Code	Type of Course Unit	ECTS- Credits
IM692	Elective Course	3

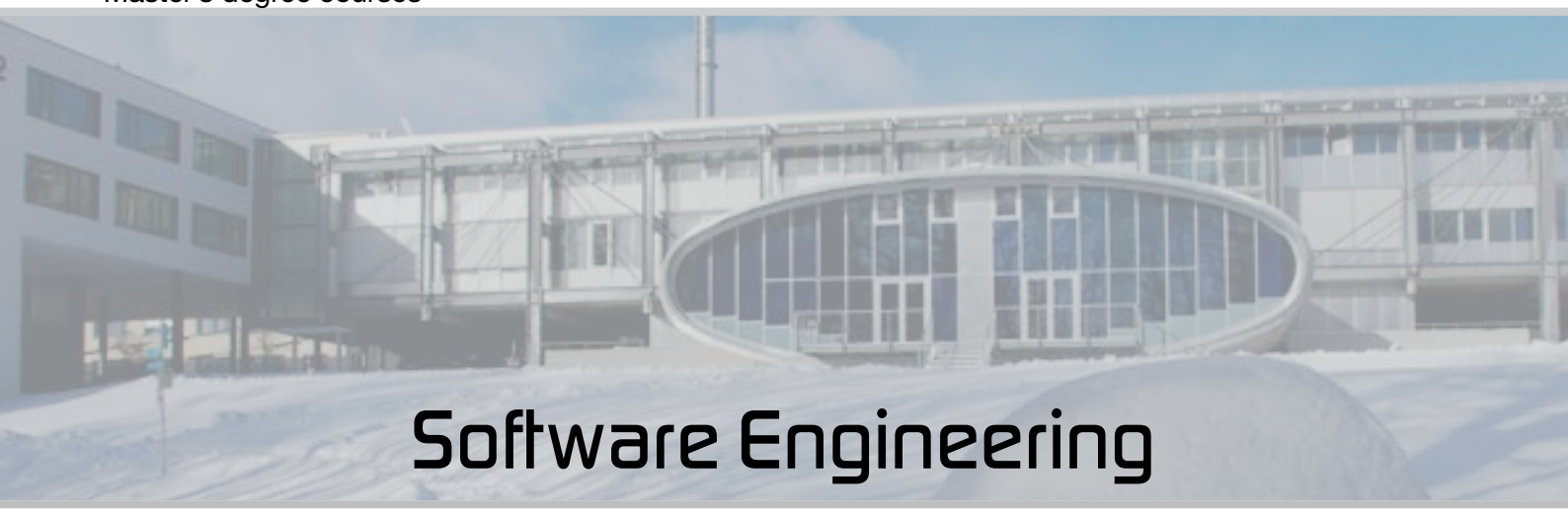
Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Jeremiah Diephuis	Final paper	Face to Face

Prerequisites

Course contents

Writing efficiently and eloquently requires a great deal more than just using suitable vocabulary and the appropriate tenses. Style, register and flow can vary a great deal depending on the purpose and context of the text being written. This course addresses the challenges involved in crafting sentences that are comprehensible, precise and defensible. The main topics include the development of logical argumentative structures, describing and interpreting data, moderating claims and handling complex grammatical issues. This course is highly recommended for students who will be writing their theses in English or for researchers who would like to hone their proposal and paper writing skills. Regular writing assignments are required.

Recommended or required reading



Software Engineering

SE

https://www.fh-ooe.at/en/hagenberg-campus/studiengaenge/master/software-engineering/

Most devices that shape our everyday lives – from computers and smartphones to coffeemakers and jet planes – depend on a guiding software code. This full-time degree programme takes graduates in practical and applied informatics to the next level. You will expand expertise in developing, implementing and evaluating highperformance software to meet the demand for an ever-expanding range of applications. Creation of high-end software is akin to building a house: you need both the skills of a craftsperson and the inspiration of an architect. This symbiotic combination is what defines the software architect. Our Master’s degree programme will empower students to become exactly that.

Data Warehousing and OLAP

Course Unit Code	Type of Course Unit	ECTS- Credits
DWO	Elective Course	4.5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Henryk Maciejewski		Face to Face

Prerequisites

Course contents

Analytical vs. direct data processing - different architectures for different requirements; Data Warehouse as a holistic depot of analytical data; real application examples of OLAP (Online Analytical Processing) data warehouse systems. Building a data warehouse: methodology of data warehouse implementation process, maintaining data integrity, accuracy and completeness, ETL (extract- transform- load), purpose and meaning of metadata. Database design for Date Warehouse: requirements concerning multidimensional queries to databases. Database technologies for OLAP.

Exercise part : Training in the use of a commercial OLAP development environment .

Recommended or required reading

Big Data Analytics and Interactive Visualization

Course Unit Code	Type of Course Unit	ECTS- Credits
	Integrated Course	5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Christoph Heinzl Barbara Traxler		Face to Face

Prerequisites

Must have succesfully finished the courses “Data Warehousing and OLAP“ (winter semester) and “Machine Learning and Data Mining“ (summer semester).

Course contents

This course is an elective subject module and consists of three parts:
Part 1: Interactive Data Visualization
Part 2: Interactive Visualization Using D3
Part 3: Big Data Analytics

Each part comprises 14 units à 45 min.
To pass this course, all three parts have to be completed successfully.

Evaluation:
Part 1: State of the art report on a topic of your choice in the field of big data analytics and interactive visualization
Part 2: Programming exercise in D3
Part 3: Programming exercise in Big data analytics

Recommended or required reading

Modelling and Simulation

Course Unit Code	Type of Course Unit	ECTS- Credits
	Integrated Course	5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Stephan Winkler		Face to Face

Prerequisites

Course contents

continuous modeling and simulation by numeric integration, systems theory basics, growth and decay models, predator-prey models, epidemiology basics, control circuits, parameters optimization by heuristic algorithms, discrete modeling and simulation, discrete event specified systems, agent based modeling and simulation; software frameworks: MATLAB / Simulink, AnyLogic, HeuristicLab

Recommended or required reading

In Wintersemester 2021/22 this course will be in German!

Note: Modelling and Simulation and Heuristic and Evolutionary Algorithms take place at the same time, therefore please choose just one of these courses!

Numerical Methods

Course Unit Code	Type of Course Unit	ECTS- Credits
	Integrated Course	

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
		Face to Face

Prerequisites

Course contents

Recommended or required reading

Heuristic and Evolutionary Algorithms

Course Unit Code	Type of Course Unit	ECTS- Credits
NHL1ILV	Integrated Course	5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Michael Affenzeller Stefan Wagner		Face to Face

Prerequisites

Course contents

Taxonomy of optimization algorithms, demarcation between numerical and heuristic optimization, examples of combinatorial optimization problems and complexity theory, search space behavior and P and NP problems. Heuristic methods: Problem specific methods vs. metaheuristics, construction vs. improvement heuristics, neighbourhood and distance of solutions, local search, trajectory based methods, simulated annealing, taboo search. Population-based methods: Ant-Colony Optimization, Swarm Intelligence, Genetic Algorithms, Evolutionary Strategies, Genetic Programming and Scatter Search. In exercises use, parameter setting, analytical and empirical analysis of different optimization techniques using HeuristicLab, a generic development and test environment for heuristic optimization procedures.

Recommended or required reading

In Wintersemester 2021/22 this course will be in English!

Note: Modelling and Simulation and Heuristic and Evolutionary Algorithms take place at the same time, therefore please choose just one of these courses!

Functional and Relative Programming

Course Unit Code	Type of Course Unit	ECTS- Credits
	Integrated Course	5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
		Face to Face

Prerequisites

Course contents

Recommended or required reading

Semantic Web Technologies

Course Unit Code	Type of Course Unit	ECTS- Credits
	Integrated Course	5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Thomas Kern Viktoria Dorfer		Face to Face

Prerequisites

Course contents

Recommended or required reading

Alternative Programming Paradigms

Course Unit Code	Type of Course Unit	ECTS- Credits
	Integrated Course	5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Erik Pitzer Stephan Dreiseitl		Face to Face

Prerequisites

Knowledge of object-oriented programming; interest in abstraction, problem decomposition, and how these aspects pertain to algorithmic problem solving.

Course contents

Paradigms are in the foreground, not the learning of new programming languages; the main focus is on the comparison of alternative problem-solving possibilities by the different paradigms (and languages). Imperative and object-oriented programming are assumed to be known; various forms of the object-oriented paradigm are discussed based on the peculiarities of languages such as Java, C# and Smalltalk. The focal points are the functional aspects of the logical programming paradigm:
Functional P. : the differences between purely functional programming (e. g. Scheme & ML without assignments, with functions as first-class values) and imperative programming languages are worked out; Logical P. : using prologue it is shown how to get a different view of programming by separating program logic and executing control. Finally, relatively new paradigms such as the generative or the aspect-oriented are briefly presented and compared with the others.

Recommended or required reading

The course is inspired by the book “Seven languages in seven weeks” by Bruce Tate. Reading the book, however, is not required for the course.

English Conversation

Course Unit Code	Type of Course Unit	ECTS- Credits
	Integrated Course	5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Isabella Moser		Face to Face

Prerequisites

Course contents

Recommended or required reading

Intelligent Agent Systems

Course Unit Code	Type of Course Unit	ECTS- Credits
	Integrated Course	5

Name of Lecturer	Assessment Methods and Criteria	Mode of Delivery
Georg Weichhart		Face to Face

Prerequisites

Course contents

Recommended or required reading