

# ENGLISH COURSES

## WINTER SEMESTER 2017/18

UNIVERSITY OF APPLIED SCIENCES UPPER AUSTRIA

HAGENBERG CAMPUS



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# Language Courses

## German Courses

# German 1

Course Code	DEU1
Type of Course Unit	Integrated Course
Year of Study	1
ECTS Credits	2
Name of Lecturer	Bettina Preßlauer
Assessment Methods and Criteria	Written Exam, homework, attendance
Mode of Delivery	Face to Face
Course contents	<p>Acquisition of basic German for everyday life (greeting, introducing oneself and getting into contact with others, shopping,...); development of communication skills and intercultural competence</p> <p>Basic knowledge of the German language and the Austrian culture; ability to use German in simple everyday situations</p> <p>Interactive learning methods, team- and group activities</p>
Prerequisites	
Recommended reading	Dictionary

# German 2

Course Code	DEU2
Type of Course Unit	Integrated Course
Year of Study	1
ECTS Credits	1.5
Name of Lecturer	Bettina Preßlauer
Assessment Methods and Criteria	Written Exam, homework, attendance
Mode of Delivery	Face to Face
Course contents	<p>Use of German in different situations of everyday life and work; development of communication skills in the target language and intercultural competence</p> <p>Knowledge of the German language in everyday life and the Austrian culture</p> <p>Interactive learning methods, team- and group activities</p>
Prerequisites	Basic German (level A1 or higher)
Recommended reading	Dictionary

# German 3

Course Code	DEU3
Type of Course Unit	Integrated Course
Year of Study	
ECTS Credits	1.5
Name of Lecturer	Bettina Preßlauer
Assessment Methods and Criteria	Written Exam, homework, attendance
Mode of Delivery	Face to Face
Course contents	
Prerequisites	Basic German (level A2 or higher)
Recommended reading	





# 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.

Course Code	SAT5-VO
Type of Course Unit	Blocked Course
Year of Study	3
ECTS Credits	0.5
Name of Lecturer	Emanuel Staudinger
Assessment Methods and Criteria	Attendance
Mode of Delivery	Face to Face
Course contents	<p>Navigation, Communication, Weather forecast, Earth observation, Mineral search, Espionage: Satellites and Satellite networks are silent companions without which the complex tasks of daily life could not be completed. Many every day uses, from car navigation systems to mobile apps require complex satellite systems. Which technologies stand behind them? What are suitable satellite orbits? What laws of physics are behind them? What are the principles of satellite communication and navigation?</p> <ul style="list-style-type: none"><li>• Introduction and Foundations: Historical development, services, satellite orbits and constellations, carrier systems, and frequency planning.</li><li>• Kepler's Laws of Orbital Motion</li><li>• Signal transmission and transmission channels: Transmission channels, antennae, antenna gain, free-space path loss, channel modelling.</li><li>• Modulation methods: Linear (Amplitude) modulation methods, performance-bandwidth diagram, bit error rates, performance and bandwidth efficiency.</li><li>• Channel access methods: Time and frequency multiplex methods.</li><li>• Satellite networks: System architecture, current satellite systems.</li><li>• High-frequency components; introduction to channel coding.</li><li>• Satellite navigation systems: Global positioning system (GPS), GALILEO.</li><li>• Principles of satellite navigation: Time-of-Arrival, Space-, Control-, and User-segment.</li><li>• Error sources, signals, and synchronization in satellite navigation: How do I obtain a position in my navigation-app?</li></ul>
Prerequisites	Fundamentals of signals and systems
Recommended reading	Slides from lecturer



# 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.

Course Code	MTD170
Type of Course Unit	Integrated Course
Year of Study	1
ECTS Credits	2
Name of Lecturer	Jeremiah Diephuis
Assessment Methods and Criteria	Oral or written exam
Mode of Delivery	Face to Face
Course contents	<p>The course covers the history and development of media technologies and traditions (radio, TV, film, computer games, Internet) and current issues in the media industry.</p> <p>Media Studies (English 1) aims to strengthen students' oral and written communication skills, particularly within the field of digital media.</p>
Prerequisites	
Recommended reading	

Course Code	MTD290T1 / MTD390T1
Type of Course Unit	Project
Year of Study	2 / 3
ECTS Credits	5 / 8.5
Name of Lecturer	
Assessment Methods and Criteria	
Mode of Delivery	Face to Face
Course contents	<p>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, and Animation design/development. Some examples of technologies that might be used, depending on the project, are Java, Unity, LibGdx, AfterEffects, Photoshop, 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:</p> <ul style="list-style-type: none"><li>• Creating a puzzle game in which the main character finds herself lost in fictional universes.</li><li>• Creating a simple rhythm-based music game</li><li>• Developing a strategy game (Group of 3 people—2 focusing on art/graphics, 1 on sounds, visual, and programming) <a href="http://hive-21.com/">http://hive-21.com/</a></li><li>• Building a website which allows users to share a sort of “diary” of development projects and receive feedback from the community</li></ul>
Prerequisites	
Recommended reading	

# Stop Motion Animation

Bachelor

MTD

Course Code	MTD352
Type of Course Unit	Integrated Course
Year of Study	3
ECTS Credits	4.5
Name of Lecturer	
Assessment Methods and Criteria	
Mode of Delivery	Face to Face
Course contents	Workflow, principles and language of related analogue animation techniques: Stop Motion, Clay Animation, Cut Out, Cartoon Animation, Rotoscoping.
Prerequisites	
Recommended reading	

Course Code	MTD362
Type of Course Unit	Integrated Course
Year of Study	3
ECTS Credits	4.5
Name of Lecturer	Wilhelm Burger
Assessment Methods and Criteria	Written Exam
Mode of Delivery	Face to Face
Course contents	Basic digital image processing, point operations, image enhancement, histogram balancing, gamma correction, linear and nonlinear filters, morphological operations, geometric operations, interpolation, simple image analysis, image comparison, spectral methods, processing of image sequences, file formats, algorithms and software.
Prerequisites	Good knowledge of Java and Object-Oriented Programming concepts
Recommended reading	Burger/Burge: Digital Image Processing -- An Algorithmic Approach, Springer, 2008

Course Code	MTD370
Type of Course Unit	Integrated Course
Year of Study	3
ECTS Credits	4.5
Name of Lecturer	Christoph Schaufler
Assessment Methods and Criteria	Project-based
Mode of Delivery	Face to Face
Course contents	<p>Fundamentals of the processing of audio signals in theory and practice. Specification and implementation of filters. Development environments with support for audio development. Reproduction of fundamental algorithms from the field of sound effects and synthesis and development of audio plug-ins (e.g. with Max/MSP/Jitter).</p>
Prerequisites	<p><b>audio processing fundamentals:</b> 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),</p> <p><b>audio synthesis fundamentals:</b> knowledge of MIDI notation / control data operation and signalflow of a subtractive synthesiser operation of a sampler or sample-based forms of synthesis</p> <p><b>programming fundamentals:</b> knowledge of boolean / logic operations &amp; basic programming skills</p> <p>analytical thinking and methodical procedure when tackling problems</p> <p>Please note that if you are interested in joining this course you will be asked to hand in work examples that you have already accomplished.</p>
Recommended reading	<p>K. C. Pohlmann, Principles of Digital Audio McGraw- Hill 2005; S. W. Smith, The Scientist and Engineer's Guide to DSP Programming</p>



Course Code	MTD380
Type of Course Unit	Integrated Course
Year of Study	3
ECTS Credits	4.5
Name of Lecturer	Rimbert Rudisch-Sommer
Assessment Methods and Criteria	Class-based activities
Mode of Delivery	Face to Face
Course contents	Using PHP-based Content Management-/WebApplication-Frameworks for the development of advanced Web Applications.
Prerequisites	Foundations in Web App & DB Development (HTML/CSS, JavaScript, PHP, SQL).
Recommended 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/>

Smartphones, smartwatches, tablets and apps are an integral part of our daily lives. They make countless routines easier and also more entertaining. Mobile computing is the technology of future and will change the way we use technological devices. Voice and gesture control systems are today in common use, just like social media. This is just the beginning of a sea change, in which mobile devices, communications and apps are set to play a key role alongside new business models. Our full-time Mobile Computing degree programme will enable you to play an active part in this revolution. Students will acquire in-depth knowledge of communications technology, informatics and application development for mobile devices. You'll be equipped to devise innovative services and apps and professionally manage projects in the field.

Course Code	PRO4
Type of Course Unit	Integrated Course
Year of Study	3
ECTS Credits	5
Name of Lecturer	Stephan Selinger (Coordinator)
Assessment Methods and Criteria	Oral Presentation
Mode of Delivery	Face to Face
Course contents	<p>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&amp;D projects and cooperations with companies.</p> <p>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.</p>
Prerequisites	
Recommended reading	

Course Code	MOS5
Type of Course Unit	Integrated Course
Year of Study	3
ECTS Credits	5
Name of Lecturer	Stephan Selinger
Assessment Methods and Criteria	Oral or written exam
Mode of Delivery	Face to Face
Course contents	<p>Sports-related mobile devices and systems are booming as never before. Not only established industry giants such as Garmin, Polar, or Suunto thrive in this market segment, companies like Samsung (e. g. Fit Gear, Gear 2) or Apple with the Apple Watch are gearing up. Runtastic - founded by mobile computing graduates - is another prime example that you can achieve anything in this area.</p> <p>The lecture “Mobile Sports” shows 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.</p>
Prerequisites	
Recommended reading	

Please note that MOH5 takes place at the same time as MOG5 and MOS5, therefore please choose just one of these courses!

Course Code	MOG5
Type of Course Unit	Integrated Course
Year of Study	3
ECTS Credits	5
Name of Lecturer	Florian Lettner
Assessment Methods and Criteria	Oral or written exam
Mode of Delivery	Face to Face
Course contents	<p>This course will convey the essentials of Mobile Games to attending students. The formidable part of practical examples on platforms like JavaME, Windows Mobile .Net or Windows Mobile Embedded will help the students to consolidate the important principles of Mobile Gaming.</p>
Prerequisites	
Recommended reading	

Please note that MOG5 takes place at the same time as MOH5 and MOS5, therefore please choose just one of these courses!



# 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.

Course Code	ENG1
Type of Course Unit	Integrated Course
Year of Study	1
ECTS Credits	2
Name of Lecturer	Irdonka Kretzschmar
Assessment Methods and Criteria	Written and oral exam
Mode of Delivery	Face to Face
Course contents	<p>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.</p>
Prerequisites	
Recommended reading	



Course Code	SEM3
Type of Course Unit	Integrated Course
Year of Study	2
ECTS Credits	2
Name of Lecturer	Marcus Nohlberg
Assessment Methods and Criteria	
Mode of Delivery	Face to Face
Course contents	<p>The BSc lectures will cover the theme “Champions of Today’s Digital World” and will tackle three challenging areas of information security:</p> <p><i>PII and Cloud - this lecture considers the issue of personally identifiable information (PII) residing in the Cloud and the risks to this information and what protection can be used to reduce and manage these risks.</i></p> <p>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.</p> <p>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.</p>
Prerequisites	
Recommended reading	



# 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.

Course Code	VPS5
Type of Course Unit	Integrated Course
Year of Study	3
ECTS Credits	2
Name of Lecturer	Stefan Wagner
Assessment Methods and Criteria	Written exam, exercise sheets
Mode of Delivery	Face to Face
Course contents	<p>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).</p>
Prerequisites	<p>For taking this course, you should know that you</p> <ul style="list-style-type: none"><li>- will have to participate in all lectures</li><li>- will have to do exercises at home</li><li>- will have to have a good knowledge of C# programming</li></ul>
Recommended reading	



# Data Science and Engineering

## DSE

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

The Master programme Data Science and Engineering with two specialization possibilities in Biomedical Data Analysis or Data Analysis in marketing and Production is not only focused on the technical and mathematic aspects of data science. It prepares graduates also through detailed exploration of interdisciplinary knowledge from application domains of future careers in the field of Data Science.

### Educational Emphasis

- Development of data understanding: Data selection, data integration and data preparation,
- Aufbau des Datenverständnisses: Datenselektion, Datenintegration und Datenaufbereitung, linking, transformation, and indexing of different data sources, development of meaningful comparison, data representation, and visualization.
- Data storage and management in combination with Big Data and Cloud technologies, including real-time data.
- Data analysis with methods from the field of Computation Intelligence and Statistics for the creation of prognosis models for answering concrete questions of the business.
- Computer Vision methods for extraction of knowledge from graphical data. Practical project for data analysis with cooperation partners from the Biomedical, Marketing, and Production industries.

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

## Multivariate Statistics (MUL)

Elementary statistical distribution functions, parametric and non-parametric statistics, multivariate methods: correlation/covariance, principal component analysis, linear discriminant analysis, partial least squares, linear and logistic regression, varimax, factor analysis, Markov chains, maximum likelihood methods, Bayesian statistics and techniques, planning of clinical trials, diagnostic tests, ROC analysis, OLAP methods using SPSS, programming in R.

## Numerical Methods (NUM)

Introduction: floating point arithmetic, examples from numerical differentiation and integration. Numerical linear algebra: least squares solutions to linear systems, eigenvalues, eigensystems, diagonalisation, fundamentals of monte carlo methods.

Optimisation: Constrained and unconstrained continuous optimisation (gradient descent, quasi-Newton methods). Integer optimisation, branch & bound, branch & cut simplex/complex method, systems of equations: algebraic equations (Newton's method). Differential systems (Runge Kutta etc.), dynamic optimisation: graph searching, Q-learning, approximation algorithms, splines, Fourier transformation.



# 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.

Course Code	DRS3
Type of Course Unit	Integrated Course
Year of Study	
ECTS Credits	6
Name of Lecturer	Dietmar Millinger
Assessment Methods and Criteria	written exam
Mode of Delivery	Face to Face
Course contents	Distributed Systems and Time Real-Time Communication and Execution Architectures Faults and Fault-Tolerance
Prerequisites	Embedded Computer Systems Programming language C Communication Systems
Recommended reading	Text Book: Hermann Kopetz, Real-Time Systems – Design Principles for Distributed Embedded Applications, Kluwer 1997



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



Course Code	ENI401
Type of Course Unit	Integrated Course
Year of Study	1
ECTS Credits	2
Name of Lecturer	Andreas Aichhorn
Assessment Methods and Criteria	written or oral exam
Mode of Delivery	Face to Face
Course contents	<p>Fundamental definitions and units: DC and AC, current, voltage, resistor, impedance, energy and power.</p> <p>Measurement technology: Fundamentals of measurements (electrical Power, electrical energy, temperature, light); measurement chain (sensor to data acquisition).</p> <p>EMC: Physically principles of electromagnetically impacts; screening and coupling decreasing measures; source and sink considerations; filtering.</p> <p>Measurement errors and accuracy: Error types (systematic, digitalization, random, ...); accuracy; resolution.</p> <p>Data acquisition concepts</p> <p>Filtering of data</p> <p>Measurement amplifiers</p>
Prerequisites	Bachelor's degree or comparable higher education; at least 60 ECTS in Informatics and advanced programming skills (Java, C/C++)
Recommended reading	<ol style="list-style-type: none"> <li>1. Charles A. Gross, Thaddeus A. Roppel, Fundamentals of Electrical Engineering, CRC Press, February 2012</li> <li>2. Oleg D. Jefimenko, Electricity and Magnetism: An Introduction to the Theory of Electric and Magnetic Fields, Electret Scientific, September 1989</li> <li>3. John G. Webster, Halit Eren, Measurement, Instrumentation, and Sensors Handbook, CRC Press, January 2014</li> <li>4. Michael Grabe, Measurement Uncertainties in Science and Technology, Springer, May 2014</li> <li>5. Henry W. Ott, Electromagnetic Compatibility Engineering, Wiley, August 2009</li> <li>6. Allen J. Wood, Bruce F. Wollenberg, Gerald B. Sheblé, Power Generation, Operation and Control, Wiley-Interscience, November 2013</li> <li>7. Leonard L. Grigsby, Electric Power Generation, Transmission, and Distribution, CRC Press, May 2012</li> </ol>

Course Code	ENI402
Type of Course Unit	Integrated Course
Year of Study	1
ECTS Credits	5
Name of Lecturer	Werner Friedl
Assessment Methods and Criteria	written or oral exam
Mode of Delivery	Face to Face
Course contents	<p>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.</p> <p>Smart Meter Smart meter rollout recommendation (EU); smart grid task forces (EU); homologation/verification of meters (Non EU/EU/National).</p> <p>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</p>
Prerequisites	Bachelor's degree or comparable higher education; at least 60 ECTS in Informatics and advanced programming skills (Java, C/C++)
Recommended reading	<ol style="list-style-type: none"><li>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.</li><li>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</li><li>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</li><li>4. Recommendation 2012/148 on preparations for smart metering roll-out Recommendation 2012/148 on preparations for smart metering roll-out: <a href="http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32012H0148:EN:NOT">http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32012H0148:EN:NOT</a></li><li>5. Working Party 29 opinion 12/2011 on smart metering: <a href="http://ec.europa.eu/justice/policies/privacy/docs/wpdocs/2011/wp183_en.pdf">http://ec.europa.eu/justice/policies/privacy/docs/wpdocs/2011/wp183_en.pdf</a></li><li>6. Smart Grid Task Force EG3 first year report 'options on handling smart grid data': <a href="http://ec.europa.eu/energy/gas_electricity/smart-grids/doc/xpert_group3_first_year_report.pdf">http://ec.europa.eu/energy/gas_electricity/smart-grids/doc/xpert_group3_first_year_report.pdf</a></li><li>7. Smart Grid Task Force EG2 regulatory recommendations for data protection, privacy: <a href="http://ec.europa.eu/energy/gas_electricity/smart-grids/doc/expert_group2.pdf">http://ec.europa.eu/energy/gas_electricity/smart-grids/doc/expert_group2.pdf</a></li><li>8. Angus Johnston, Guy Block: EU Energy Law, OUP Oxford, 2012.</li><li>9. M. Roggenkamp, C. Redgwell, I. Del Guayo: Energy Law in Europe: National, EU, and International Regulation, Oxford Univ Pr., 2007.</li><li>10. Benth F.E., Kholodnyi V. A., Laurence P.: Quantitative Energy Finance, Springer 2014.</li><li>11. Ocana C.: Regulatory institutions in liberalised electricity markets: OECD 2001</li><li>12. Organization for Economic Co-operation and Development: Security of Gas Supply in Open Markets. OECD Publishing and International Energy Agency 2004</li></ol>

Course Code	ENI403
Type of Course Unit	Integrated Course
Year of Study	1
ECTS Credits	5
Name of Lecturer	Dagmar Auer / Franz Fischer
Assessment Methods and Criteria	written or oral exam
Mode of Delivery	Face to Face
Course contents	<p>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.</p> <p>Business processes Rollout process Processes modelling Methodologies, tools.</p>
Prerequisites	Bachelor's degree or comparable higher education; at least 60 ECTS in Informatics and advanced programming skills (Java, C/C++)
Recommended reading	<ol style="list-style-type: none"><li>1. Heinrich Seidlmeier: Prozessmodellierung mit ARIS®: Eine beispielorientierte Einführung für Studium und Praxis, Vieweg+Teubner Ver-lag, 2010.</li><li>2. Manuel Laguna, Johan Marklund: Business Process Modeling, Simulation and Design, CRC Press Inc., 2013.</li><li>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.</li><li>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.</li></ol>

Course Code	ENI404
Type of Course Unit	Integrated Course
Year of Study	1
ECTS Credits	5
Name of Lecturer	Stephan Selinger
Assessment Methods and Criteria	written or oral exam
Mode of Delivery	Face to Face
Course contents	<p>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.</p>
Prerequisites	Bachelor's degree or comparable higher education; at least 60 ECTS in Informatics and advanced programming skills (Java, C/C++)
Recommended reading	<ol style="list-style-type: none"><li>1. G. Booch, J. Rumbaugh, I. Jacobson: The Unified Modeling Language User Guide. Second Edition. Addison Wesley. 2005.</li><li>2. J. Holt: UML for Systems Engineering: watching the wheels. Second Edition. Institution of Engineering and Technology. 2007</li><li>3. Object Management Group (OMG): Unified Modeling (OMG UML), Superstructure, Version 2.4.1. 2011.</li><li>4. Object Management Group (OMG): Unified Modeling (OMG UML), Infrastructure, Version 2.4.1. 2011</li><li>5. S. W. Ambler: The Elements of UML 2.0 Style. Cambridge University Press. 2005</li><li>6. J. Arlow, I. Neustadt: UML and the Unified Process. Practical Object-Oriented Analysis and Design. Addison-Wesley. 2002.</li><li>7. A. Cockburn: Writing Effective Use Cases. Addison-Wesley. 2001</li><li>8. I. Jacobson, G. Booch, J. Rumbaugh: The Unified Software Development Process. Addison-Wesley. 1999.</li><li>9. D. Steinberg, F. Budinsky, M. Paternostro, E. Merks: EMF: Eclipse Modeling Framework, Second Edition. Addison-Wesley 2009.</li><li>10. Object Management Group (OMG): MOF 2.0/XMI Mapping Specification, v2.1.1</li><li>11. Object Management Group (OMG): Object Constraint Language. Version 2.2. 2010.</li><li>12. J. Warmer, A. Kleppe. The Object Constraint Language: Getting Your Models Ready for MDA. Second Edition. Addison-Wesley. 2003.</li><li>13. R. C. Gronback: Eclipse Modeling Framework. A Domain-Specific Language Toolkit. Addison-Wesley. 2009.</li><li>14. L. Bettini: Implementing Domain-Specific Languages with Xtext and Xtend. Packt Publishing. 2013</li><li>15. K. S. Rubin: Essential Scrum. A Practical Guide to the Most Popular Agile Process. Addison-Wesley. 2012.</li><li>16. S. P. Berczuk: Software Configuration Management Patterns: Effective Teamwork, Practical Integration. Addison-Wesley. 2003</li></ol>

Course Code	ENI406
Type of Course Unit	Integrated Course
Year of Study	2
ECTS Credits	5
Name of Lecturer	Wolfgang Stumpf
Assessment Methods and Criteria	
Mode of Delivery	Face to Face
Course contents	
Prerequisites	
Recommended reading	

Course Code	ENI501
Type of Course Unit	Integrated Course
Year of Study	1
ECTS Credits	5
Name of Lecturer	Gerald Ostermayer
Assessment Methods and Criteria	written or oral exam
Mode of Delivery	Face to Face
Course contents	<p>State of the art communication technology Communication architectures and models for smart grid Physical data communications, access, detection and estimation techniques for smart grid Smart grid and wide-area networks Spectrum requirement planning</p> <p>Communication channel characteristics: CENELEC A-D Band; FCC; ARIB; EPRI; ISM; COSTxxx; IMT etc.</p> <p>Radio communication systems: Cellular systems; wireless local area networks; terrestrial broadcasting; shortrange communication.</p> <p>Standards / Upcoming standards: IEEE P1901; ITU-T G.hn; IEEE 802.15.4; 6LoWPAN; IEEE 802.11; ETSI GS OSG 001; G3-PLC; homeplug.</p>
Prerequisites	Bachelor's degree or comparable higher education; at least 60 ECTS in Informatics and advanced programming skills (Java, C/C++)
Recommended reading	<ol style="list-style-type: none"><li>1. Erik Dahlman, Stefan Parkvall, Johan Skold, Per Beming: 3G Evolution: HSPA and LTE for Mobile Broadband, Academic Press, 2010.</li><li>2. Bernhard H. Walke: Mobile Radio Networks: Networking, Protocols and Traffic Performance, Wiley, 2001.</li><li>3. Hideaki Takagi, Bernhard H. Walke: Spectrum Requirement Planning in Wireless Communications: Model and Methodology for IMT – Advanced, Wiley, 2008.</li><li>4. Dominik Prause: Smart-Meter Datenübertragung mit COFDM-Systemen: Eine Analyse für den Frequenzbereich gemäß EN 50065, Dip-Ionica Verlag, 2010.</li><li>5. Kenneth C. Budka, Jayant G. Deshpande, Marina Thottan: Communication Networks for Smart Grids: Making Smart Grid Real (Computer Communications and Networks), Springer, 2014.</li><li>6. Ekram Hossain, Zhu Han, H. Vincent Poor: Smart Grid Communications and Networking, Cambridge University Press, 2012.</li><li>7. Stephen F. Bush: Smart Grid: Communication-Enabled Intelligence for the Electric Power Grid (Wiley - IEEE), John Wiley &amp; Sons, 2014.</li><li>8. Subhas C Mukhopadhyay, Joe-Air Jiang: Wireless Sensor Networks and Ecological Monitoring (Smart Sensors, Measurement and Instrumentation), Springer, 2013.</li><li>9. Haniph A. Latchman, Srinivas Katar, Larry Yonge, Sherman Gavett: Homeplug AV and IEEE 1901: A Handbook for PLC Designers and Users, Wiley, 2013.</li><li>10. Gilbert Held: Understanding Broadband over Power Line, Auerbach Publications, 2006.</li><li>11. Robert Faludi: Building Wireless Sensor Networks: with ZigBee, XBee, Arduino, and Processing, O'Reilly Media, 2010.</li></ol>

Course Code	ENI508
Type of Course Unit	Integrated Course
Year of Study	2
ECTS Credits	5
Name of Lecturer	Stephan Hutterer
Assessment Methods and Criteria	
Mode of Delivery	Face to Face
Course contents	<p>- 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.</p> <p>- 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).</p> <p>- Practical Part: Application of selected SCADA and simulation too</p>
Prerequisites	
Recommended reading	

Course Code	ENI515
Type of Course Unit	Integrated Course
Year of Study	1
ECTS Credits	5
Name of Lecturer	Johannes Sametinger
Assessment Methods and Criteria	
Mode of Delivery	Face to Face
Course contents	
Prerequisites	
Recommended reading	



Course Code	ENI601
Type of Course Unit	Seminar
Year of Study	2
ECTS Credits	1
Name of Lecturer	Thomas Grill
Assessment Methods and Criteria	
Mode of Delivery	Face to Face
Course contents	
Prerequisites	
Recommended reading	

Course Code	ENI602
Type of Course Unit	Project
Year of Study	2
ECTS Credits	4
Name of Lecturer	Christoph Schaffer
Assessment Methods and Criteria	
Mode of Delivery	Face to Face
Course contents	
Prerequisites	
Recommended reading	



# 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.

Course Code	PLM2ILV
Type of Course Unit	Lecture
Year of Study	1
ECTS Credits	1.5
Name of Lecturer	Harry Sneed
Assessment Methods and Criteria	
Mode of Delivery	Face to Face
Course contents	<p>This lecture focuses on software product lines or product families for customized mass production in the software industry.</p> <p>Variability in software product lines, planning and scoping of product lines, organizational structures and processes for development of product lines.</p> <p>Meeting times (all at 08:00) 30.09 07.10 14.10 21.10 Exam: 04.11</p>
Prerequisites	<p>engineering for product lines (domain analysis), modeling of product lines (model-driven architecture), configuration management for product lines, reference architecture for product lines, generative programming, component technology for product lines, re-engineering</p>
Recommended reading	



# Information Security Management

## ISM

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

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.

Course Code	ISM15.1.LAN
Type of Course Unit	Integrated Course
Year of Study	1
ECTS Credits	2
Name of Lecturer	Martina Gaisch
Assessment Methods and Criteria	Continuous Assessment
Mode of Delivery	Face to Face
Course contents	<p>This course aims at preparing participants for the Cambridge BEC higher certificate. Students get competencies in receptive and productive language skills.</p> <p>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.</p> <p>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.</p>
Prerequisites	Participants need to have a sound level of English (at least B2) - both in written and oral discourse.
Recommended reading	



# 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.

# Writing and Typesetting with Math

Course Code	IM060
Type of Course Unit	Workshop
Year of Study	
ECTS Credits	1
Name of Lecturer	Wilhelm Burger
Assessment Methods and Criteria	Attendance (3 sessions) and minor homework
Mode of Delivery	Face to Face
Course contents	<p>This workshop is about writing professional documents that include mathematical elements. You learn how to develop a basic mathematical notation, choose appropriate symbols and operators, define compound structures (e.g., vectors and matrices), functions, logical expressions etc. It is shown how to correctly place mathematical elements in the main text, use proper punctuation, reference equations, formulate algorithms etc. The course is mainly intended as a preparation for project and thesis work in engineering. The goal is to avoid common mistakes and to produce documents that are up to professional standards.</p> <p>The course will start around the end of October (exact dates TBA).</p>
Prerequisites	A basic understanding of LaTeX is helpful but not required (a working setup will be provided).
Recommended reading	

Elective Course: Only offered if enough students register



Course Code	IM400
Type of Course Unit	Integrated Course
Year of Study	1
ECTS Credits	4.5
Name of Lecturer	Michael Haller
Assessment Methods and Criteria	Presentation
Mode of Delivery	Face to Face
Course contents	<p>Students will learn the fundamental concepts of user-centered design thinking. Students will work in teams of two on an interaction design project that is supported by lectures, readings, and discussions. Topics will include User Centered Design, Human, Attention, Perception, Recognition, Prototyping (low-fidelity, high-fidelity), Human Performance Models (e.g., Hick's Law, Fitts' Law, Keystroke-Level Model), Design Evaluation, Heuristics, and Quantitative &amp; Qualitative Evaluation.</p>
Prerequisites	
Recommended reading	

Compulsory for regular Interactive Media Students.

Course Code	IM410
Type of Course Unit	Integrated Course
Year of Study	1
ECTS Credits	4.5
Name of Lecturer	Vanessa Prüller
Assessment Methods and Criteria	Written Exam
Mode of Delivery	Face to Face
Course contents	Modern Software Architectures and Methods of System Design, Modeling- and Design-Patterns, Development Environments, Test-cases, Use-cases, Performance vs. Elegance.
Prerequisites	
Recommended reading	

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Compulsory for regular Interactive Media Students.

Course Code	IM420
Type of Course Unit	Elective Course
Year of Study	1
ECTS Credits	6
Name of Lecturer	Kehrer, Schedl
Assessment Methods and Criteria	Final Report and Written Exam
Mode of Delivery	Face to Face
Course contents	<p>Students will learn the fundamental concepts of advanced computer graphics techniques. Topics will include introduction in GPU programming, advanced shading and texturing techniques (parallax bumpmapping), photo-realistic and non-photorealistic rendering (hatching, painterly renderer) techniques, shadow generation (shadow volumes, shadow mapping). Real-time rendering techniques, introduction in XNA.</p>
Prerequisites	<p>Profound mathematical, programming knowledge, basic knowledge of Computer Graphics</p>
Recommended reading	

Course Code	IM430
Type of Course Unit	Elective Course
Year of Study	1
ECTS Credits	6
Name of Lecturer	Rimbert Rudisch-Sommer
Assessment Methods and Criteria	Exam
Mode of Delivery	Face to Face
Course contents	Developing Java-based multilayered Hypermedia Applications, JEE Foundations: Servlets, JSP, Model-2 Architecture, Spring-Framework, Persistence Libraries (eg. MyBatis, Hibernate, JPA), Frontend Frameworks (eg. SpringMVC, JSF), Agile Development Methods.
Prerequisites	Foundations in Web Development (HTML/CSS), good knowledge of Java and Databases (SQL).
Recommended reading	

Course Code	IM440
Type of Course Unit	Elective Course
Year of Study	1
ECTS Credits	6
Name of Lecturer	Roman Divotkey
Assessment Methods and Criteria	Exam and project work
Mode of Delivery	Face to Face
Course contents	<p>Computer game genres, general software architecture of games and interactive applications, software design patterns, architectural patterns, 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.</p>
Prerequisites	<p>Profound programming knowledge, basic knowledge of game programming</p>
Recommended reading	

# Project 1

Course Code	IM490
Type of Course Unit	Elective Course
Year of Study	1
ECTS Credits	9
Name of Lecturer	Roman Divotkey (Coordinator)
Assessment Methods and Criteria	Project, presentation
Mode of Delivery	Face to Face
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.
Prerequisites	
Recommended reading	

# Design for Physical Prototyping

Course Code	IM601
Type of Course Unit	Elective Course
Year of Study	2
ECTS Credits	4.5
Name of Lecturer	Kathrin Probst, Patrick Parzer, Michael Haller
Assessment Methods and Criteria	
Mode of Delivery	Face to Face
Course contents	<p>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 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.</p>
Prerequisites	
Recommended reading	

Course Code	IM621
Type of Course Unit	Elective Course
Year of Study	2
ECTS Credits	4.5
Name of Lecturer	Andreas Stöckl
Assessment Methods and Criteria	
Mode of Delivery	Face to Face
Course contents	<p>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.</p>
Prerequisites	
Recommended reading	



# Special Topic in Interactive Media

Course Code	IM640
Type of Course Unit	Integrated Course
Year of Study	2
ECTS Credits	4.5
Name of Lecturer	
Assessment Methods and Criteria	
Mode of Delivery	Face to Face
Course contents	
Prerequisites	
Recommended reading	

Course Code	IM645
Type of Course Unit	Integrated Course
Year of Study	2
ECTS Credits	4.5
Name of Lecturer	Roman Divotkey
Assessment Methods and Criteria	
Mode of Delivery	Face to Face
Course contents	<p>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.</p>
Prerequisites	
Recommended reading	

Course Code	IM646
Type of Course Unit	Integrated Course
Year of Study	2
ECTS Credits	4.5
Name of Lecturer	Doris Zachhuber, Jakob Doppler, Alexander Rind
Assessment Methods and Criteria	
Mode of Delivery	Face to Face
Course contents	<ul style="list-style-type: none"><li>• Principles of information- and data visualisation</li><li>• Concepts for concise and expressive representation of complex information.</li><li>• Application of color, space, animation and interactivity in visualisation.</li></ul>
Prerequisites	
Recommended reading	

Course Code	IM692
Type of Course Unit	Elective Course
Year of Study	1/2
ECTS Credits	3
Name of Lecturer	Jeremiah Diephuis
Assessment Methods and Criteria	
Mode of Delivery	Face to Face
Course contents	<p>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.</p>
Prerequisites	
Recommended reading	



# Mobile Computing

## MC

<https://www.fh-ooe.at/en/hagenberg-campus/studiengaenge/master/mobile-computing/>

Students of our international, English-taught Master in Mobile Computing will get a more in-depth insight of the almost limitless possibilities of a truly global, all-pervasive, mobile computing connectivity. The challenge is adapting ever newer technological applications and environmentally sensitive automated systems across the full spectrum of everyday activities – including sport, medicine and care of the elderly – to create ever more powerful and user-friendly synergies. Taste the future here, now!

Course Code	MC401
Type of Course Unit	Elective Course
Year of Study	1
ECTS Credits	5
Name of Lecturer	Jens Krösche
Assessment Methods and Criteria	Final Exam
Mode of Delivery	Face to Face
Course contents	<p>General Aspects of Location-Based Services, Pervasive/Ubiquitous Computing, Context Definition, Personalization and Individualization, Targets, Context Acquisition, Modeling Context Derivation, Context Distribution, Context-Aware Architectures, Context-Aware Adjustment of System Structures/Contents, Rule Systems.</p> <p>Since the mid 1990 the idea of computers merging with the environment and supporting the user in his daily activities has been a well known idea in many research facilities. But through the massive distribution and the processing/sensing power of today's Smartphones the idea more and more becomes reality. Therefore the need arises to utilize techniques enabling applications to react to the aspects of the ever changing environment and the user's needs/goals/tasks. This module gives an overview of the corresponding aspects/techniques/patterns to write applications which can react to a dynamic environment.</p>
Prerequisites	Excellent Java programming skills
Recommended reading	

Course Code	MC402
Type of Course Unit	Integrated Course
Year of Study	1
ECTS Credits	5
Name of Lecturer	W. Wiedermann, G. Pospischil
Assessment Methods and Criteria	Project work, final exam
Mode of Delivery	Face to Face
Course contents	<p>Survey of Services and Service Architecture, Mobile Messaging (SMS, EMS, MMS, Unified Messaging), IMS (IP Multimedia Sub-system) incl. Group List Management, Presence, Location-Based Services, SIP, VoIP</p> <p>Immersion in the construction and functions of public and private mobile networks. Knowledge of architecture, protocols, interfaces and services in order to be able to develop applications in a future-oriented way. Survey of planning aspects to assure the availability of services.</p>
Prerequisites	Mobile Computing Background
Recommended reading	<ol style="list-style-type: none"><li>1. M. Miller: Voice Over IP Technologies. Building the Converged Network, Hungry Minds Inc., 2002.</li><li>2. J. Bannister, P. Mather, S. Coope: Convergence Technologies for 3. G Networks, John Wiley and Sons Ltd., 2003.</li><li>3. G. Camarillo: SIP Demystified, McGraw Hill, 2001.</li><li>4. M. Poikselka, G. Mayer, H. Khartabil: The IMS, John Wiley and Sons Ltd., 2004.</li><li>5. G. Camarillo, M. Garcia-Martin: The 3G IP Multimedia Subsystem (IMS), John Wiley and Sons Ltd., 2004.</li><li>6. G.L. Bodic: Mobile Messaging, Wiley, 2005.</li></ol>

Course Code	MC403
Type of Course Unit	Reading Course + Project
Year of Study	1
ECTS Credits	5
Name of Lecturer	Self-learning course
Assessment Methods and Criteria	Project
Mode of Delivery	Face to Face
Course contents	<p>Especially the strong fluctuation and heterogeneity of smartphones, together with their widespread usage, make the development of mobile applications a laborious undertaking. Students gain insight in how to develop software for different mobile devices.</p> <p>As this is a “self-learning course”, every student participating in this lecture needs to announce which TWO operating systems (Android/iOS/Windows Phone) he/she wants to work with per email to the lecture coordinator. As a result, access to the lecture notes is provided.</p> <p>After confirmation every student has to define (a) suitable project topic(s) with the corresponding OS advisors. In preparation to this, every student has to write a one page summary that introduces the project idea (motivation, content, requirements, possible UI-design, ...) and send it to the corresponding advisors.</p>
Prerequisites	advanced programming skills (preferable Java/C#/Swift)
Recommended reading	



Course Code	MC404
Type of Course Unit	Elective Course
Year of Study	1
ECTS Credits	5
Name of Lecturer	Stephan Selinger
Assessment Methods and Criteria	Final Exam
Mode of Delivery	Face to Face
Course contents	<p>Software Architecture Design Process, Process Models, Software Pattern, Architectural Pattern (Layers, Pipes and Filters, MVC, Blackboard, ...), Design Pattern (Builder, Factory, Command, Decorator, Strategy, ...), Idioms, Anti-Pattern</p> <p>Due to the restrictive and highly dynamical environment, designing mobile applications is a feasible task. But, to develop flexible and maintainable software architecture prior knowledge of well tested software design techniques and patterns on the architectural side as well as on the component side is required. Therefore this module focuses on a survey and evaluation of common known software design techniques and software pattern.</p>
Prerequisites	object oriented programming
Recommended reading	

Course Code	MC405
Type of Course Unit	Integrated Course
Year of Study	1
ECTS Credits	5
Name of Lecturer	Christoph Anthes
Assessment Methods and Criteria	Final Exam
Mode of Delivery	Face to Face
Course contents	<p>Mathematical and physical fundamentals, AR Applications, Image Registration, Tracking, Augmented Reality Interaction Techniques, Mobile Augmented Reality, Mobile Augmented Reality Platforms and SDKs (ARToolKit, mixare, QCAR, osgART, Junaio, Layar, Wikitude).</p> <p>Augmented Reality (i. e. the overlay of computer graphics onto the real world) is increasingly becoming popular and on smartphones. This course provides students with an introduction to the field of Augmented Reality as well as the necessary knowledge on how to build mobile Augmented Reality applications.</p> <p>Immersion in the multimedia entertainment systems, driver supporting and security systems of vehicles as well as traffic telematics. Knowledge of automotive operating systems, vehicular communication systems, bus systems etc. in order to be able to implement vehicular infotainment and security systems.</p>
Prerequisites	
Recommended reading	<ol style="list-style-type: none"><li>1. O. Bimber, R. Raskar: Spatial Augmented Reality: Merging Real and Virtual Worlds. A K Peters, 2005.</li><li>2. A. Alasdair: iOS 4 Sensor Programming: Augmented Reality and Location Enabled iPhone and iPad Apps, O'Reilly, 2011.</li><li>3. R. R. Hainich: The End of Hardware, 3rd Edition: Augmented Reality and Beyond, BookSurge Publishing, 2009.</li><li>4. M. Haller, B. Thomas, and M. Billinghurst: Emerging Technologies of Augmented Reality: Interfaces and Design, IGI Global, 2006.</li><li>5. W. R. Sherman, A. Craig: Understanding Virtual Reality: Interface, Application, and Design, Morgan Kaufmann, 2002.</li><li>6. S. Cawood, M. Fiala: Augmented Reality: A Practical Guide, Pragmatic Bookshelf, 2008.</li><li>7. L. Madden: Professional Augmented Reality Apps for Smartphones: Building Mobile Augmented Reality and Image Recognition Applications, Wiley, 2011.</li></ol>

Course Code	MC406
Type of Course Unit	Integrated Course
Year of Study	1
ECTS Credits	5
Name of Lecturer	Florian Lettner
Assessment Methods and Criteria	Final Exam
Mode of Delivery	Face to Face
Course contents	<p>Computer game genres, Game Design for the Mobile Games Market, general software architecture of games and interactive applications, software design patterns, architectural patterns, related algorithms and data structures, representation of entities and states, real-time processing of events, game physics, game specific artificial intelligence, architecture and integration of middle ware components like physics, graphics, sound, logic and artificial intelligence, quality assurance in game development, performance-oriented game programming, software project management, game development with Scrum, software testing. The theoretical fundamentals of game programming are put into practice on current mobile platforms.</p> <p>Within the framework of this module, all of the important components of mobile infotainment will be examined.</p>
Prerequisites	
Recommended reading	

Course Code	MC407
Type of Course Unit	Integrated Course
Year of Study	1
ECTS Credits	5
Name of Lecturer	Maurer Walter
Assessment Methods and Criteria	Post-Module Case Study
Mode of Delivery	Face to Face
Course contents	<p>Project Management Basics, International Project Management, Risk Management, Managing Cultural Diversity/(International), Teamwork, Organisational Culture and Management Structures, General Agile Project Management Methods, Agile Processes (eXtremeProgramming(PairProgramming), Scrum, Crystal, Dynamic System Development Methods, Feature Driven Development, etc.), Test Driven Development, Frequent Code Reviews, etc.)</p> <p>Due to the rapidly changing IT world and based on a real life scenario (in the best case the students master project) deeper knowledge about modern “agile” project engineering technologies and advanced project management skills will be acquired. Which help improve software development, speedup development cycles, foster maintainability, and on the same time provide flexibility for changing project requirements.</p>
Prerequisites	
Recommended reading	

Course Code	MC408
Type of Course Unit	Integrated Course
Year of Study	1
ECTS Credits	5
Name of Lecturer	Stephan Selinger
Assessment Methods and Criteria	Final Exam
Mode of Delivery	Face to Face
Course contents	<p>Introduction to Systems Engineering, Modeling Using UML, Unified Process, Structure and Behavior Diagrams, UML Style Guidelines, Language Architecture of UML2 (Metamodel, Meta Object Facility (MOF)), XML Metadata Interchange Format (XMI), UML Profiles, Domain Specific Languages and Domain Specific Modeling, Model Driven Architecture, Object Constraint Language (OCL), Eclipse Modeling Framework (EMF), Graphical Modeling Framework, Modelto- Model transformation, Model-to-Text transformation, Code Generation.</p> <p>Graduates possess advanced knowledge in the area of UML Modeling and in the area of Domain-Specific Languages (DSLs) with a special focus on secure, mobile and embedded systems. The knowledge of software metrics, as well as the methodical testing of software systems, completes this know-how.</p>
Prerequisites	
Recommended reading	

Course Code	MC502
Type of Course Unit	Integrated Course
Year of Study	2
ECTS Credits	5
Name of Lecturer	Christopher Schwarzlmüller
Assessment Methods and Criteria	Project Assignment and Final Exam
Mode of Delivery	Face to Face
Course contents	<ul style="list-style-type: none"><li>• Overview and architecture of vehicles and automotive computer systems: functional domains (power train, chassis,body, HMI, telematics), ECUs, head units, instrument cluster displays</li><li>• Developing trends in Automotive Systems and feature evolution</li><li>• AUTOSAR (AUTomotive Open System Architecture) and bus system interfaces LIN, CAN, TTCAN, Flexray, MOST,OBD, Kline</li><li>• Communication and Information Systems: Instrumentation, automotive sound systems, parking systems, trip recorders, navigation systems, telematics</li><li>• Advanced Driver Assistance Systems (ADAS): Adaptive Cruise Control (ACC), lane departure warning, blind spot detection, automatic parking</li><li>• Vehicular Communication Systems (Car to car, Car to Infrastructure...)</li><li>• Automotive Software Engineering: product lines, re-use, modelbased development of automotive embedded systems</li><li>• Car infotainment systems design using state of the art solutions and tools for HMI design</li></ul>
Prerequisites	<ul style="list-style-type: none"><li>· Basic programming skills in C++ or C# and Java</li><li>· Basic know-how of Android/iOS application principles</li><li>· Interest in modern computer graphics systems</li></ul>
Recommended reading	

Course Code	MC503
Type of Course Unit	Elective Course
Year of Study	1
ECTS Credits	5
Name of Lecturer	Michael Maurer
Assessment Methods and Criteria	
Mode of Delivery	Face to Face
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), 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), Google Cloud Platform (GCE, App Engine, GCS, Cloud Datastore).
Prerequisites	
Recommended reading	

Course Code	MC508
Type of Course Unit	Integrated Course
Year of Study	2
ECTS Credits	5
Name of Lecturer	Stephan Selinger
Assessment Methods and Criteria	Final Exam
Mode of Delivery	Face to Face
Course contents	<p>Fundamentals of RT Systems (hard/soft RT systems, scheduling etc.), Distributed Systems, Distributed Scheduling Algorithms, Holistic Scheduling, Global Time, Clock Synchronization, Network Time Protocol (NTP), Real-Time Communication (Event- and Time-Triggered Solutions), Real-Time Java, Real-Time CORBA, Real-Time Transport Protocol (RTP).</p> <p>Immersion in real-time design and programming with a special focus on real-time communication.</p>
Prerequisites	
Recommended reading	<ol style="list-style-type: none"><li>1. H. Kopetz: Real-Time Systems: Design Principles for Distributed Embedded Applications, Springer, 1997</li><li>2. W. S. Liu: Real-time Systems, Prentice Hall, 2003.</li><li>3. E. J. Bruno, G. Bollella: Real-Time Java Programming With Java RTS, Prentice Hall 2009.</li><li>4. C. Perkins: RTP: Audio and Video for the Internet, Addison- Wesley, 2003.</li><li>5. A. S. Tanenbaum, M. van Steen: Distributed Systems, Prentice Hall, 2003.</li><li>6. P. Rybacz: Expert Network Time Protocol: An Experience in Time with NTP, Apress, 2005</li><li>7. D. Mills: Computer Network Time Synchronization: The Network Time Protocol on Earth and in Space, Second Edition, CRC Press, 2010.</li><li>8. J. Sales: Symbian OS Internals: Real-Time Kernel Programming, Wiley, 2005.</li><li>9. Q. Li, C. Yao: Real-Time Concepts for Embedded Systems, CMP Books.</li></ol>



Course Code	MC511
Type of Course Unit	Integrated Course
Year of Study	2
ECTS Credits	5
Name of Lecturer	
Assessment Methods and Criteria	
Mode of Delivery	Face to Face
Course contents	<p>Fundamentals of Biosignal Analysis, EEG, ECG, EMG, , Measuring Blood Pressure, Measuring Blood Flow, Measuring Cardiac Output, Pulsoximetry, Functional Electro-Stimulation (FES), Lactate Measurement,</p> <p>Heart-Rate Variability, Estimation of VO<sub>2</sub>, Biomedical Sensor, Pervasive Computing and Healthcare, Wireless Health Monitoring Systems, Ambient Assistive Health, Fall Detection, Security and Privacy in Telemedicine.</p>
Prerequisites	
Recommended reading	

# Short-Range Wireless Communication

Master

MC

Course Code	MC514
Type of Course Unit	Integrated Course
Year of Study	2
ECTS Credits	5
Name of Lecturer	
Assessment Methods and Criteria	
Mode of Delivery	Face to Face
Course contents	Regulatory Framework Conditions, Spectral Areas, Standardization, Security, Bluetooth, WLAN (802.11), HomeRF, DECT, ZigBee, UWB, RFID, NFC
Prerequisites	
Recommended reading	

Course Code	MC515
Type of Course Unit	Elective Course
Year of Study	1
ECTS Credits	5
Name of Lecturer	
Assessment Methods and Criteria	Final Exam
Mode of Delivery	Face to Face
Course contents	<p>The Role of IT – “Enablers” of Supply Chain Processes, Collaborative Planning, Forecasting and Replenishment (CPFR), Efficient Consumer Response (ECR), Automatic Identification (Barcode, RFID) in the Supply Chain, Enterprise Application Integration (EAI) Tools, Warehouse Management Systems (WMS)</p> <p>Mobile computing technologies play a very important role in the logistics. The course provides an overview of current technologies, processes and tools which are used in this specific domain.</p>
Prerequisites	
Recommended reading	<ol style="list-style-type: none"><li>1. R. Melzer-Ridinger: Supply Chain Management, Fortis,</li><li>2. H. Arndt: Supply Chain Management, Gabler, 2. Auflage, 2005.</li><li>3. D. Pfaff, B. Skiera, J. Weiss: Financial Supply Chain Management, Galileo Press, 2003.</li><li>4. Axel Kuhn, Bernd Hellingrath: Supply Chain Management, Springer, 2002.</li><li>5. Helmut Baumgarten: Logistik im E-Zeitalter. Die Welt der globalen Logistik-Netzwerke, Frankfurter Allgemeine Buch, 2002.</li><li>6. Dirk Seifert: Efficient Consumer Response. Category Management, Supply Chain Management und CPFR als neue Strategieansätze, Rainer Hamp Verlag, 2004.</li><li>7. Michael Ten Hompel, Thorsten Schmidt: Warehouse Management, Springer, 2005</li></ol>

Course Code	MC517
Type of Course Unit	Integrated Course
Year of Study	2
ECTS Credits	5
Name of Lecturer	Rudolf Ramler und Mario Winterer
Assessment Methods and Criteria	Final Exam
Mode of Delivery	Face to Face
Course contents	<p>Software metrics (e. g., code coverage, kloc, bugs/kloc, cyclomatic complexity, function points, cohesion and coupling,...), black box and white box testing, unit tests, integration tests, system test, regression tests, testing of non-functional properties, test plans, testing tools, automated testing, testing and the software development process, test-driven development, model-based testing, GUI-testing, UML Testing Profile, Continuous Integration and Delivery, certifications</p> <p>This course is a step by step description of the software metrics. It includes introduction to foundations of measurement theory, models of software engineering measurement, software products metrics, software process metrics and measuring management.</p>
Prerequisites	
Recommended reading	

Course Code	MC520
Type of Course Unit	Integrated Course
Year of Study	2
ECTS Credits	5
Name of Lecturer	
Assessment Methods and Criteria	
Mode of Delivery	Face to Face
Course contents	<p>Introduction to Technology Trends (Embedded Processors, Miniaturized Sensors, Wireless Communication and New Materials) and Ubiquitous Computing Characteristics and Systems, Sensor Fundamentals (e.g. Conditioning, Filtering and ADC/DAC), Sensor Characteristics (e.g. Sensitivity, Offset, Accuracy, Dynamic Range, Linearity and Noise), Sensor Types (e.g. Active vs. Passive Sensors, Resistive and Capacitive Sensors, Thermocouples, Piezoelectric, Hall Effect and CCD Sensors), Spatial Sensors and Applications (Accelerometers, Tilt Sensing and Dead Reckoning with Accelerometers, Gyroscopes, Digital Compass and Tilt-Compensated Compass, Orientation Sensors, Wireless Indoor Positioning Techniques and Technologies), Mobile Ad-Hoc Networks and Routing Protocols (e.g. Flooding, Distance Vector Routing, DSDV Routing, DSR and Zone Routing), Wireless Communication Technologies (e.g. WLAN/IEEE 802.11, Bluetooth/IEEE 802.15.1, ZigBee/IEEE 802.15.4, RFID and NFC), Wireless Sensor Networks (e.g. Communication Architecture, Sensor Nodes, Applications, Design Characteristics, Power Scavenging, Time Synchronization, Distributed Localization and Simulation Environments).</p>
Prerequisites	
Recommended reading	

Course Code	MC601
Type of Course Unit	Seminar
Year of Study	1
ECTS Credits	2
Name of Lecturer	Grill Thomas
Assessment Methods and Criteria	Seminar paper and oral presentation
Mode of Delivery	Face to Face
Course contents	<p>Understanding the scientific method, the peer reviewing process, and the organization of program committees and scientific conferences. Improving scientific paper reading and paper writing skills. Improving scientific presentation skills.</p> <p>Course participants learn the techniques of writing a scientific work and implement these into their own work. Through support and feedback of the advisor, a successive advancement with continuous improvement in quality is assured.</p>
Prerequisites	
Recommended reading	



# Secure Information Systems

## SIM

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

Trust and security are the key components of the Information Society. Security experts with up-to-date know-how across IT, management, and law are in great demand. Especially in view of the need for enhanced security as rapid technical advances pose greater threats to the safety of data transfer, storage, and archiving. Our full-time degree programme majors on in-depth study and specialisation across IT security. Topics include information management, digital identities, secure software engineering, network security, law, and ethics. The main focus of this degree programme is on practical training as well as independent and systematic work with an emphasis on the development of communication skills.

Course Code	CSE
Type of Course Unit	Integrated Course
Year of Study	first (Master), last (Bachelor)
ECTS Credits	3
Name of Lecturer	Markus Zeilinger
Assessment Methods and Criteria	continuous assessment
Mode of Delivery	Face to Face
Course contents	<p>Introduction (security goals, threats, vulnerabilities, attacks, attackers, ...), Cryptography (random numbers, stream and block ciphers, message authentication codes, hash functions, public key encryption, digital signatures, certificates), Authentication and Authorization, Software Security (typical flaws in software, exploits, web attacks, malware), network security (threats in networks, firewalls, intrusion detection, VPN), Privacy and Privacy Preserving Techniques, Management of Information Security (policies, processes, risk assessment, awareness, governance, auditing)</p>
Prerequisites	<p>computer networks, operating systems and programming skills (ideally in C/C++) on senior undergraduate or graduate level in computer science</p>
Recommended reading	<p>Pfleeger, C., Pfleeger, S., Security in Computing, Prentice Hall, 2007 Stallings, W., Computer Security: Principles and Practice, Pearson, 2012</p>



# Current Safety Issues

Course Code	SAS3
Type of Course Unit	Integrated Course
Year of Study	
ECTS Credits	2
Name of Lecturer	
Assessment Methods and Criteria	
Mode of Delivery	Face to Face
Course contents	
Prerequisites	
Recommended reading	

Course Code	SWA1SE
Type of Course Unit	Integrated Course
Year of Study	1
ECTS Credits	2
Name of Lecturer	Weippl und Fuß
Assessment Methods and Criteria	
Mode of Delivery	Face to Face
Course contents	
Prerequisites	
Recommended 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 craftsman 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 Code	DWO
Type of Course Unit	Elective Course
Year of Study	1
ECTS Credits	4.5
Name of Lecturer	Affenzeller/ Macijewski
Assessment Methods and Criteria	
Mode of Delivery	Face to Face
Course contents	<p>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.</p> <p>Exercise part : Training in the use of a commercial OLAP development environment .</p>
Prerequisites	
Recommended reading	

# Big Data Analytics and Interactive Visualization

Master

SE

Course Code

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Type of Course Unit

Integrated Course

Year of Study

2

ECTS Credits

5

Name of Lecturer

Barbara Franz, Samuel Gratzl, Christoph Heinzl

Assessment  
Methods and Criteria

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Mode of Delivery

Face to Face

Course contents

The course module consists of three parts:

1. Big Data Analytics
2. Interactive Visualization Using D3
3. Interactive Visualization Focus

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Prerequisites

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Recommended  
reading

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Course Code

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Type of Course Unit

Integrated Course

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Year of Study

2

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ECTS Credits

5

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Name of Lecturer

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Assessment  
Methods and Criteria

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Mode of Delivery

Face to Face

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Course contents

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Prerequisites

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Recommended  
reading

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Course Code	NHL1ILV
Type of Course Unit	Integrated Course
Year of Study	1
ECTS Credits	4.5
Name of Lecturer	
Assessment Methods and Criteria	
Mode of Delivery	Face to Face
Course contents	<p>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.</p> <p>Exercise part : Training in the use of a commercial OLAP development environment .</p>
Prerequisites	
Recommended reading	

Course Code

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Type of Course Unit

Integrated Course

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Year of Study

1

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ECTS Credits

4.5

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Name of Lecturer

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Assessment  
Methods and Criteria

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Mode of Delivery

Face to Face

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Course contents

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Prerequisites

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Recommended  
reading

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# Multicore Programming and Distributed Computing

Course Code

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Type of Course Unit

Integrated Course

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Year of Study

2

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ECTS Credits

5

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Name of Lecturer

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Assessment  
Methods and Criteria

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Mode of Delivery

Face to Face

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Course contents

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Prerequisites

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Recommended  
reading

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Course Code

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Type of Course Unit

Integrated Course

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Year of Study

2

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ECTS Credits

5

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Name of Lecturer

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Assessment  
Methods and Criteria

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Mode of Delivery

Face to Face

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Course contents

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Prerequisites

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Recommended  
reading

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# Alternative Programming Paradigms

Course Code

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Type of Course Unit

Integrated Course

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Year of Study

2

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ECTS Credits

5

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Name of Lecturer

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Assessment  
Methods and Criteria

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Mode of Delivery

Face to Face

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Course contents

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Prerequisites

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Recommended  
reading

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# Cutting-edge Specializations

Course Code

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Type of Course Unit

Integrated Course

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Year of Study

2

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ECTS Credits

3

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Name of Lecturer

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Assessment  
Methods and Criteria

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Mode of Delivery

Face to Face

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Course contents

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Prerequisites

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Recommended  
reading

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Course Code

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Type of Course Unit

Integrated Course

Year of Study

1

ECTS Credits

5

Name of Lecturer

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Assessment  
Methods and Criteria

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Mode of Delivery

Face to Face

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Course contents

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Prerequisites

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Recommended  
reading

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Course Code

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Type of Course Unit

Integrated Course

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Year of Study

2

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ECTS Credits

1

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Name of Lecturer

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Assessment  
Methods and Criteria

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Mode of Delivery

Face to Face

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Course contents

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Prerequisites

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Recommended  
reading

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# Teamwork Practice

Course Code

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Type of Course Unit

Integrated Course

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Year of Study

2

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ECTS Credits

1

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Name of Lecturer

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Assessment  
Methods and Criteria

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Mode of Delivery

Face to Face

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Course contents

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Prerequisites

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Recommended  
reading

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# English Conversation

Course Code

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Type of Course Unit

Integrated Course

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Year of Study

2

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ECTS Credits

2

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Name of Lecturer

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Assessment  
Methods and Criteria

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Mode of Delivery

Face to Face

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Course contents

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Prerequisites

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Recommended  
reading

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