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## German A1 / 2 + 3 + 4

<b>Course title</b>	German A1 / Parts 2, 3 and 4
<b>Course ID</b>	83141
<b>Person in charge</b>	Dr. Virginia Wallner
<b>Type of course</b>	Lecture with exercises
<b>Course of studies</b>	For exchange students (GE)
<b>Level of course</b>	Beginner A1 (in accordance with CEFR)
<b>Prerequisites</b>	<ul style="list-style-type: none"> <li>• Knowledge of the own native language's basic grammar categories (verbs, nouns, adjectives, subjects, direct objects)</li> <li>• German basics (spelling, greeting, introducing, numbers)</li> </ul>
<b>SWS</b>	6
<b>ECTS</b>	6
<b>Workload</b>	Total: 180 / In-class: 70 / Self-study: 110
<b>Assessment methods</b>	Written test (90 min.)
<b>Language of Instruction</b>	German
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>• Can understand and produce some familiar and daily expressions used in very recurring situations of communication as well as very simple statements aiming at satisfying certain concrete needs of the social life</li> <li>• Can identify himself and answer questions concerning, for example, his nationality, his age, his</li> </ul>

place of residence, his school and possibly, to ask himself questions of this type to somebody

- Can participate in an ordinary interaction, at least partially, by means of simple statements (centered on one or two words) also by using his mother tongue or other acquired languages tongues if the interlocutor speaks slowly and clearly and shows himself cooperative and friendly

**Course contents**

- Grammar
  - Modal verbs/ sentence brackets
  - Positions of a verb in a sentence
  - Prepositions
  - Separable verbs
  - The perfect form with 'haben/ sein'
  - Possessives
  - Dative verbs
  - The imperative
  - Simple Past 'war/ hatte'
  - The perfect form
  - Subjunctive II
- Topics
  - Free time activities
  - Food stuff and meals
  - Means of transport and vacation
  - Apartments and houses
  - Parts of the body
  - Describing people and their character
  - Household activities
  - Weather
  - Holidays and celebrations

**Teaching methods**

Introduction and explanation of topics by lecturer, partner and group work, feedback for partner and group work by lecturer, listening comprehension exercises

**Recommended literature**

Menschen. Deutsch als Fremdsprache. Kursbuch A1.1 mit Lerner DVD-ROM. Hueber. Kapitel 7-12 ISBN 978-3-19-301901-1

Menschen. Deutsch als Fremdsprache. Arbeitsbuch A1.1 mit Audio-CD. Hueber. Kapitel 7-12 ISBN 978-3-19-311901-8

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Menschen. Deutsch als Fremdsprache. Kursbuch A1.2 mit Lerner DVD-ROM. Hueber. Kapitel 13-24 ISBN 978-3-19-501901-9

Menschen. Deutsch als Fremdsprache. Arbeitsbuch A1.2 mit Audio-CD. Hueber. Kapitel 13-24 ISBN 978-3-19-511901-6

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**Miscellaneous**

Students must attend a minimum of 75% of classes and take all final exams in order to obtain the certificate of achievement for the course.

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Course descriptions for German language courses at higher levels:  
<https://th-deg.de/en/students/language-electives#german>

## English for GE Students B2

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<b>Course title</b>	English for General Engineering Students
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<b>Course ID</b>	10491
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<b>Level of course</b>	This course is B2, meaning students should already have a basic understanding of the English language. They should be able to write about and discuss various ideas and concepts.
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<b>ECTS</b>	2
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<b>Course type</b>	Language Training Course
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<b>SWS</b>	2
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<b>Semester</b>	Winter and summer
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<b>Workload in hours</b>	Total: 60 / In-class: 30 / Self-study: 30
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<b>Lecturer</b>	Neal O'Donoghue, MA
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<b>Course objectives</b>	<p>This course aims to deepen students' encounter with the English language in a technical context by giving practical training in specialized vocabulary, grammar and language usage. The four cardinal language skills – listening, speaking, reading, and writing – will play an integral role in this training.</p> <p>The course is designed to be relevant and interesting for Engineering students and will be adapted to their learning needs and study areas.</p> <p>By the end of the course, participants should have a more comprehensive understanding of, and enhanced fluency in, the English language in an engineering context.</p>
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<b>Course contents</b>	<p>Obligatory topics:</p> <ul style="list-style-type: none"><li>• Numbers and mathematical operations</li><li>• Shapes and dimensions</li></ul>
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- Basic physics and the scientific worldview
- Materials and their properties
- Case study on an area related to technology /physics/engineering
- Grammar/ communication skills

Variable content will be determined on the basis of a student survey conducted in the first session. Current world events (including news events and popular culture) and recent technological innovations may be used as a basis for discussions.

**Teaching methods**

Teaching methods focus on improving the four cardinal language skills and include group discussions and group projects; individual work; mini-presentations; role-plays; close reading and listening activities; dictation; grammar games; and various follow-up viewing and writing activities.  
 Work not completed in class should be done at home. Self-study assignments will be set on a weekly basis.

**Assessment method**

Written exam (60 min + listening section)  
 No dictionaries are allowed.  
 Exam structure:

- Part 1: Listening comprehension(s) 2-5 minutes
- Part 2: Reading comprehension(s)
- Part 3: Vocabulary and technical content
- Part 4: Grammar (maximum 10% of total exam points, excluding writing exercise)
- Part 5: Writing composition (150-200 words)

The exam will be based on topics covered during the semester.

**Recommended literature**

Astley, Peter, and Lewis Lansford. Engineering 1: Student's Book. Oxford: Oxford UP, 2013. Print.  
 Bauer, Hans-Jürgen. English for Technical Purposes. Berlin: Cornelsen, 2000. Print.  
 Bonamy, David. Technical English 4. Harlow, England: Pearson Education, 2011. Print.  
 Bonamy, David, and Christopher Jacques. Technical English 3. Harlow: Pearson Longman, 2011. Print.  
 Brieger, Nick, and Alison Pohl. Technical English: Vocabulary and Grammar. Oxford: Summertown, 2002. Print.

Dummett, Paul. Energy English: For the Gas and Electricity August 2017 Industries. Hampshire: Heinle, Cengage Learning, 2010. Print.

Dunn, Marian, David Howey, and Amanda Ilic. English for Mechanical Engineering in Higher Education Studies Coursebook. Reading: Garnet Education, 2010. Print.

engine: Englisch für Ingenieure. <[www.engine-magazin.de](http://www.engine-magazin.de)> (Darmstadt). Various issues. Print.

Foley, Mark, and Diane Hall. MyGrammarLab. Harlow: Pearson, 2012. Print.

Glendinning, Eric H., and Norman Glendinning. Oxford English for Electrical and Mechanical Engineering. Oxford: Oxford UP, 1995. Print.

Glendinning, Eric H., and Alison Pohl. Technology 2. Oxford: Oxford UP, 2008. Print.

Heidenreich, Sharon. English for Architects and Civil Engineers. Wiesbaden: Vieweg + Teubner Verlag, 2008. Print.

Ibbotson, Mark. Cambridge English for Engineering. Cambridge: Cambridge UP, 2008. Print.

Ibbotson, Mark. Professional English in Use. Engineering: Technical English for Professionals. Cambridge: Cambridge UP, 2009. Print.

Markner-Jäger, Brigitte. Technical English: Civil Engineering and Construction. Haan-Gruiten: Verl. Europa-Lehrmittel, 2013. Print.

Murphy, Raymond. English Grammar in Use. Cambridge: Cambridge UP, 2004. Print.

Schäfer, Wolfgang. Construction Milestones: Englisch Für Bau-, Holz- Und Anlagenberufe. Stuttgart: Klett, 2013. Print.

Wagner, Georg, and Maureen Lloyd. Zörner. Technical Grammar and Vocabulary: A Practice Book for Foreign Students. Berlin: Cornelsen, 1998. Print.

**Language of instruction**

English

**Prerequisite**

B1 / A-levels / school leaving certificate giving right of entry to higher education / 7-9 years of English

## Basics of International Sales and Business Development

<b>Course title</b>	Basics of International Sales and Business Development
<b>Course ID</b>	268
<b>ECTS</b>	2
<b>Course type</b>	Lecture with group work and presentations
<b>SWS</b>	2
<b>Semester</b>	Winter and summer
<b>Lecturer</b>	Ibrahim Waked
<b>Course objectives</b>	General knowledge of international sales and strategic business development mechanisms. As well as profound analysis of practical case studies.
<b>Course contents</b>	<ul style="list-style-type: none"> <li>• Basics of sales and business development</li> <li>• Analysis of market potential including cultural &amp; political aspects, correlation between microeconomic and demographic aspects, (PESTELO analysis)</li> <li>• Relevancy of world bank reports on general economic performance and their implementation in company BD strategy</li> <li>• Market entry and risk management</li> </ul>
<b>Recommended literature</b>	<p><b>Strategic Management</b> by Richard Lynch von Pearson Longman</p> <p><b>Business Development Management</b> By Lutz Becker, Walter Gora, Tino Michalski</p>
<b>Teaching methods</b>	Lecture with integrated project development examples
<b>Assessment method</b>	Presentation and seminar paper
<b>Language of instruction</b>	English



## Business Storytelling

<b>Course title</b>	Business Storytelling
<b>Course ID</b>	296
<b>ECTS</b>	2
<b>Course type</b>	Elective
<b>SWS</b>	2
<b>Semester</b>	Winter and summer
<b>Workload in hours</b>	Total: 60 / In-class: 30 / Self-study: 30
<b>Lecturers</b>	Diego and Raphael Fiche
<b>Course objectives</b>	<p>At the end of this course, students will be able to:</p> <ul style="list-style-type: none"> <li>• Recognize key elements that go into persuasive storytelling</li> <li>• Identify types of stories and their purposes</li> <li>• Create compelling stories to achieve business goals</li> <li>• Apply acquired knowledge to develop a compelling story to persuade others to think or act in a different way.</li> </ul>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>• Introduction to Business Storytelling</li> <li>• Power of Business Stories: when and why to tell them</li> <li>• Types of Business Stories and Their Purposes</li> <li>• Structuring Your Story to Engage the Audience</li> <li>• Storytelling techniques</li> <li>• Enhance Your Storytelling Skills</li> </ul>
<b>Recommended literature</b>	<p>Janis Forman (2013), <i>Storytelling in Business: The Authentic and Fluent Organization</i></p> <p>Seth Godin(2005), <i>All Marketers Are Liars</i></p>

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<b>Teaching methods</b>	<ul style="list-style-type: none"><li>• Lectures</li><li>• Group work</li><li>• Case studies</li><li>• Presentation</li><li>• Exercises</li></ul>
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<b>Assessment method</b>	Class workshops / presentation / case studies / seminar paper
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<b>Language of instruction</b>	English
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<b>Prerequisites</b>	None
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## Intercultural Training for Germany and Bavaria

<b>Course title</b>	Intercultural Training for Germany and Bavaria
<b>ECTS</b>	1
<b>Course type</b>	Elective but <b>compulsory</b> exchange students
<b>SWS</b>	1
<b>Semester</b>	Winter and summer
<b>Workload in hours</b>	30 hours
<b>Name of Instructor</b>	Lisa Werner
<b>Course objectives</b>	Participants get an understanding of the different theories of "culture" and learn about stereotypes and traditions in Bavaria. Furthermore, the participants get information on Germany and Bavaria as well as the Deggendorf Institute of Technology.
<b>Course contents</b>	<ul style="list-style-type: none"> <li>I. Culture (theories)</li> <li>II. Customs and Rituals in Germany/Bavaria</li> <li>III. Information on Germany and Bavaria and the DIT</li> <li>IV. Quiz and Presentation</li> <li>V. Culture Shock</li> </ul>
<b>Recommended literature</b>	<p>Bolten J. und Ehrhardt C., Interkulturelle Kommunikation, Verlag Wissenschaft &amp; Praxis 2003;          Bolten J, Einführung in die interkulturelle Wirtschaftskommunikation, Vandenhoeck &amp; Ruprecht 2007</p>
<b>Teaching methods</b>	<p>The course is organized according to four pillars:</p> <ul style="list-style-type: none"> <li>1. Culture</li> <li>2. Customs and Rituals</li> <li>3. Information on Germany/Bavaria</li> <li>4. Culture Shock</li> </ul>

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Whereas hard facts are taught in a classical lecture style, students will do lots of role-plays, critical incidents, short movies and do a quiz.

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**Assessment method** Participation, Quiz and Presentation (online: paper)

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**Language of instruction** English/German

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**Prerequisite** None

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**Miscellaneous** Requirement for the participation in the elective (AWP) "Bavarian Culture"

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## Bavarian Culture

<b>Course title</b>	Bavarian Culture
<b>Course ID</b>	229
<b>SWS</b>	2
<b>Semester</b>	Winter and summer
<b>ECTS</b>	2
<b>Course type</b>	Elective
<b>Language of instruction</b>	English
<b>Name of lecturer</b>	Jennifer Hauer
<b>Course objectives</b>	Participants get a deeper understanding of the traditional and contemporary Bavarian culture by integrating knowledge about customs, language, and history with culturally routed events.
<b>Course contents</b>	<ol style="list-style-type: none"> <li>1. Hard facts           <ol style="list-style-type: none"> <li>1.1. History</li> <li>1.2. Demographics</li> <li>1.3. Geography</li> </ol> </li> <li>2. Customs and rituals           <ol style="list-style-type: none"> <li>2.1. Traditional</li> <li>2.2. Contemporary</li> </ol> </li> <li>3. Language</li> <li>4. Events</li> </ol>
<b>Teaching methods</b>	<p>The course is organized according to four pillars:</p> <ol style="list-style-type: none"> <li>1. Hard Facts</li> <li>2. Customs and Rituals</li> <li>3. Language</li> <li>4. Events</li> </ol> <p>Whereas hard facts are taught in a classical lecture style, students should experience aspects of the culture in a lively manner through knowledge dissemination of cultural experts, off-campus seminars at events of traditional</p>

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cultural origin, as well as learning and engaging in cultural rituals themselves. The aim is to deepen and complement the contents taught in the Orientation Week.

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**Recommended literature**

Jonas, B., Gebrauchsanweisung für Bayern, Piper Verlag, 2007

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**Assessment methods**

Seminar paper

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**Prerequisites**

Participants should have attended the introductory Intercultural Training during the Orientation Week.

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## Cross-Cultural Team Building

<b>Course title</b>	<b>Cross-Cultural Team Building Workshop</b>
<b>Course ID</b>	291
<b>Lecturer</b>	Prof. Dr. Johann Nagengast
<b>Course type</b>	Elective
<b>SWS</b>	2
<b>Semester</b>	Winter and summer
<b>ECTS</b>	2
<b>Assessment method</b>	Seminar paper
<b>Course language</b>	English
<b>Course objectives</b>	<p>Globalisation demands that managers possess the basic skills required to work together in international teams. Many companies actively encourage the development of these skills through teambuilding or team development programs. Especially for change management, team development plays an increasingly important role. Here the critical goal is to optimise how the group members work together as a team. Key factors affecting a team's success include organisation, structures, processes, culture and relationships.</p> <p>International Team Building is conducted at the beginning of the semester as a three day off-campus seminar. The hands-on, outdoor training gives the students intensive exposure to the multifaceted nature of group dynamics.</p> <p>By working together to solve complex problems and through structured feedback sessions, the participants become sensitised to the rolls they assume in group interactions, to the limitations imposed by the German and their own</p>

cultures, and to the conditions required for effective team work.

The course supports the integration of foreign students into campus and social life and helps build lasting working relationships among all participants.

The skills of giving and receiving of feedback are learned in the protective atmosphere of small groups through intensive exchanges between instructors and participants. This leads to improved observation and communication skills.

Moreover, the group members continually switch roles. This promotes a deeper understanding of social interaction, helps members to reflect on their contribution to the group process, encourages members to experiment with new behavioural concepts, and improves the group's capacity to co-operate and perform. Final feedback rounds offer the possibility to align the members' self-images with the perception others have of them, to reduce "blind spots", to increase self-confidence and their ability to reflect.

The capacity to give appropriate feedback in various situations, to monitor one's self image as well as the consequences of one's own behaviour form the basis for a successful career in management.

**Course contents**

Group dynamics, processes and structures in groups; Roles in groups (roles in tasks and supporting roles); Group leadership; Effect of one's actions in groups; The "give and take" of feedback; Self-image and how others see you; Communication levels (content versus relationship); Conditions for successful co-operation; Cultural influences on teamwork.

Note: The main emphasis of this course is not the conveyance of theoretical knowledge, but rather learning directly from experience. The theories on which the intervention and evaluation sessions are based are taught in the course "Human Resources Management".

**Teaching methods**

This course is organised as an interactive experience and activity based training program. With the help of complex tasks, timed interaction activities combined with elements of surprise, classical outdoor training exercises, moderated feedback and reflection sessions, participants are taught the necessary conditions for effective teamwork.



The teaching methods are based on the principles of self-organised learning. The instructors define their roles in terms of Schein's model of process consulting.

They intervene by questioning the participants in a manner designed not only to examine their perspectives, but to introduce new perspectives and stimulate the group's creative process.

The responsibility for these process remains with the participants.

In the context of the learning environment, the students enjoy the opportunity to increase their observation, communication, co-operation, self-reflection, teamwork and management skills as well as their self-confidence.

In addition, the course offers the students the chance to network and develop sustainable work relationships at the start of their studies.

**Suggested Literature**

Baron, R. S.: *Group Process, Group Decision, Group Action*, 2<sup>nd</sup>. Ed., Buckingham, 2003;

Buchanan, D., Huczynski, A.: *Organizational Behavior*, 5<sup>th</sup> Ed., Harlow, 2004;

Wagner, M., Waldmann, R.: *Vom Outdoor-Training zur Teamentwicklung, Welchen Beitrag leisten Hochseilgärten?* in: Jagenlauf, M./Michl, W. (Hrsg.) *Erleben und Lernen – Internationale Zeitschrift für handlungsorientiertes Lernen*, 1/2004

**Notes**

The weekend seminar is characterised by team teaching in a mountain hostel. The team consists of Prof. Dr. Nagengast and trained tutors selected from participants in the course „Train the Trainer“. The tutors make it possible to conduct the training in small „protected“ groups (around 8) and to give qualified feedback.

## Intercultural Skills

<b>Course title</b>	Intercultural Skills
<b>Course ID</b>	288
<b>ECTS</b>	2
<b>Course type</b>	Elective
<b>SWS</b>	2
<b>Semester</b>	Winter semester
<b>Lecturer</b>	Ariadna Fürstenau
<b>Course objectives</b>	<p>During this course, students shall get a deeper insight in theoretical as well as practical concepts behind cultural differences and their relevance. Based on those theories students will work on case studies which help them expanding their inter- and cross-cultural skills on a personal as well as professional level. Overall target is to combine the findings of intercultural research with practical applications and interpretations of the same. This shall enable the students to gain the ability to move and act securely and confident in a globalized world.</p> <p>A further target of the course is to enable students to acquire the ability to reflect on their own culture and culture related behavior and concepts.</p>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>• Definition of Culture</li> <li>• Cultural Self-Referencing</li> <li>• Cultural Differences</li> <li>• Culture Shock</li> </ul>

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	<ul style="list-style-type: none"> <li>• Cultural Stereotyping</li> <li>• Critical Incidents</li> <li>• Cultural Dimensions (Hofstede, Hall, Trompenaars)</li> <li>• High/Low Contexts</li> <li>• Iceberg Model vs. Dune Model</li> <li>• Sender/Receiver Model</li> <li>• Intercultural Communication</li> <li>• Interculturality / Multiculturalism / Transculturality</li> </ul>
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<b>Recommended literature</b>	<ul style="list-style-type: none"> <li>• Bolten, J.: Einführung in die Interkulturelle Wirtschaftskommunikation, Göttingen, Vandenhoeck &amp; Ruprecht Stuttgart UTB GmbH (2007)</li> <li>• Bolten, J.: Interkulturelle Kompetenz, Erfurt, Landeszentrale f. polit. Bild. Thüringen (2012)</li> <li>• Hall, E. T., Hall, M. R.: Understanding Cultural Differences, reprint, Yarmouth, Intercultural Press (2000)</li> <li>• Hofstede, G.: Cultures and Organizations, 2nd ed., New York et al., Mc Graw-Hill (2005)</li> <li>• Hofstede, G.: Culture's Consequences, 2nd ed., Thousand Oaks, Sage Publications (2003)</li> <li>• Trompenaars, F., Hampden-Turner, C.: Riding the Waves of Culture, London, Brealey Publishing, (1997)</li> <li>• Trompenaars, F., Hampden -Turner, C.: Managing People across Cultures, Chichester, Capstone Publishing (2004)</li> </ul>
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<b>Teaching methods</b>	Lectures, group work, case studies
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<b>Assessment method</b>	Presentation and seminar paper
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<b>Language of instruction</b>	English
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<b>Prerequisite</b>	None
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## Industrial Wastewater Treatment

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<b>Course title</b>	Industrial Wastewater Treatment
<b>ECTS</b>	2 ECTS
<b>Course type</b>	Lecture
<b>SWS</b>	2 SWS
<b>Semester</b>	Winter and summer
<b>Workload in hours</b>	Total: 60 / In-class: 30 / Self-study: 30
<b>Lecturer</b>	Prof. Dr.-Ing. Andrea Deininger
<b>Course objectives</b>	Methods and concepts of industrial wastewater treatment
<b>Course contents</b>	Legal Requirements Integrated Measures for Pollution Control Design Criteria Mechanical and Physical treatment Chemical Treatment Biological Treatment Examples
<b>Recommended literature</b>	Industrial Wastewater Management, Treatment, and Disposal, 3e MOP FD-3 (WEF Manual of Practice) by Water Environment Federation (Jun 17, 2008)  Industrial Wastewater Treatment, Recycling and Reuse by Vivek V. Ranade and Vinay M Bhandari (Sep 26, 2014)  Wastewater Engineering: Treatment and Resource Recovery by Inc. Metcalf & Eddy, George Tchobanoglous, H. David Stensel and Ryujiro Tsuchihashi (Sep 3, 2013)  Biological Wastewater Treatment, Third Edition by C. P. Leslie Grady Jr., Glen T. Daigger, Nancy G. Love and Carlos D. M. Filipe (May 9, 2011)

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**Teaching methods**      Lecture with integrated project development examples

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**Assessment method**      Seminar and examination paper

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**Language of instruction**      English

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**Prerequisite**      Principles of process engineering

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## Simplified Microcontroller Programming

<b>Course title</b>	Simplified Microcontroller Programming
<b>ECTS</b>	2
<b>Course type</b>	Lecture with practical exercises
<b>SWS</b>	2
<b>Semester</b>	Winter and summer
<b>Workload in hours</b>	Total: 60 / In-class: 30 / Self-study: 30
<b>Lecturer</b>	Johann Gerner
<b>Course objectives</b>	<p>In almost all areas of technical installations, microcontrollers constitute the core of control and regulating engineering. By means of various university initiatives, systems have been developed that are both inexpensive and easy to program and therefore they are especially suitable for students who do not have an extensive basic knowledge in the field of electrical engineering. Based on the simple development system "Arduino", students will learn how can be solved technical problems in the various engineering disciplines with the aid of software and hardware. Here, the handling of hardware-based programming is exercised and solution approaches are developed that are presented in the various sensors and actuators.</p>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>• Introduction: presentation of the development system Arduino and its sub-systems</li> <li>• Testing and analysis of existing sample programs under consideration of special problem cases</li> <li>• Reading and implementing Fritzing diagrams and wiring diagrams</li> <li>• Inclusion and application of external program libraries</li> <li>• Application programming of different sensors and their characteristics</li> <li>• Control of different actuators and introduction to the applied technology</li> </ul>

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	<ul style="list-style-type: none"><li>• Program development for simple measurement and control applications</li><li>• Information about current development trends in microcontroller engineering</li></ul>
<b>Recommended literature</b>	Massimo Banzi, Arduino für Einsteiger (2012); O'Reilly Simon Monk, Programming Arduino Next Steps: Going Further with Sketches
<b>Teaching methods</b>	Seminar-like lessons and practical tasks in the laboratory
<b>Assessment method</b>	Presentation of project results
<b>Language of instruction</b>	English
<b>Prerequisites</b>	Fundamentals of Informatics, experience with Windows

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## Statistics for Engineers

<b>Course title</b>	Statistics for Engineers
<b>ECTS</b>	5
<b>Course type</b>	Lecture/ practical exercises
<b>SWS</b>	4
<b>Semester</b>	Winter and summer
<b>Workload in hours</b>	Total: 150 / In-class: 60 / Self-study: 90
<b>Lecturer</b>	Prof. Dr. Peter Ullrich
<b>Course objectives</b>	This is an introductory course to statistics with emphasis on applications in engineering. You will learn how to use statistical methods to analyse and visualise experimental data. Furthermore, the statistical programming language R is used for practical exercises.
<b>Course contents</b>	Descriptive Statistics, Probability Theory, Inductive Statistics, Programming with R.
<b>Recommended literature</b>	
<b>Teaching methods</b>	Lesson / practical work
<b>Assessment method</b>	Written examination, 90 min.
<b>Language of instruction</b>	English
<b>Prerequisite</b>	Elementary calculus

## Introduction to Soil Mechanics

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<b>Course title</b>	Introduction to Soil Mechanics
<b>ECTS</b>	2
<b>Course type</b>	Lecture and exercises Presentations Discussion
<b>SWS</b>	2
<b>Semester</b>	Winter and summer
<b>Lecturer</b>	Prof. Dr.-Ing. Parviz Sadegh Azar

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<b>Course objectives</b>	<p>The objective of this course is to introduce the subject of soil mechanics and provide the basics of geotechnical engineering.</p> <p>Some of the important topics that students will learn during the course: soil structure and grain size; identification and classification of soils for engineering purposes; physical and engineering properties of soils; fundamental behaviour of soils subjected to various forces; groundwater and seepage through soils; compaction; consolidation; shear strength; and bearing capacity of soils.</p> <p>Students will get acquainted to several geotechnical problems and documentation of geotechnical observations. Upon successful completion of the course, students should be able to apply fundamentals of soil mechanics and principles of geotechnical engineering in the analysis, design, and construction of civil engineering projects.</p>
<b>Course contents</b>	<p>The subject will give an introduction to:</p> <ul style="list-style-type: none"><li>• Classification of soil materials</li><li>• Stresses and strain in soil</li><li>• Shear strength of soil</li><li>• Lateral earth pressure</li><li>• Primary settlement of soil and calculations</li><li>• Slope stability</li><li>• Bearing capacity of foundations</li><li>• Uplift and hydraulic failure</li></ul>

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<b>Recommended literature</b>	<p>R.F. Craig. "Soil Mechanics", Van Nostrand Reinhold Company.</p> <p>B. M. Das, "Principles of Geotechnical Engineering", PWS-KENT.</p> <p>David F. McCarthy, "Essentials of Soil Mechanics and Foundations" Prentice Hall.</p> <p>R. D. Holtz, W. D. Kovacs, and T. C. Sheahan "An introduction to Geotechnical Engineering", Prentice-Hall.</p> <p>T. W. Lambe and R. V. Whitman, "Soil Mechanics", John Wiley &amp; Sons, Inc.</p> <p>C. Liu and J. B. Evett, "Soils and Foundations", Prentice Hall.</p> <p>S. Prakash, "Fundamentals of Soil Mechanics", S.P. Foundation</p> <p>K. Terzaghi and R. B. Peck, "Soil Mechanics in Engineering Practice", John Wiley &amp; Sons, Inc.</p>
<b>Teaching methods</b>	<p>This course is a comprehensive course of integrating theory and practice. For each of the above topics students will</p> <ul style="list-style-type: none"><li>• first understand the theoretical background (lecture),</li><li>• then the students get to solve a related problem (exercise),</li><li>• followed by practical application samples and further cases of using the theoretical background in practice</li></ul>
<b>Assessment method</b>	Written examination, 90 min.
<b>Language of instruction</b>	English
<b>Prerequisite</b>	Mathematics

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## Introduction to Geotechnical Engineering

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<b>Course title</b>	Introduction to Geotechnical engineering
<b>ECTS</b>	2
<b>Course type</b>	Lecture and exercises Presentations Discussion
<b>SWS</b>	2
<b>Semester</b>	Winter
<b>Lecturer</b>	Prof. Dr.-Ing. P. Sadegh Azar
<b>Course objectives</b>	<p>This unit of study aims to introduce you to the fundamentals and basic techniques used in Foundation Engineering. Specifically, it will provide you with the design and construction principles used in Foundation Engineering type structures such as earth retaining structures, sheet piles and shallow footings.</p> <p>Some of the important topics that students will learn during the course:</p> <ol style="list-style-type: none"><li>1. Analyse earth retaining structures to determine active, passive and at rest lateral earth pressures (and associated forces).</li><li>2. Design the dimensions of retaining gravity and cantilever walls and assess the stability of these designed walls.</li><li>3. Determine the appropriate section of sheet piles and the depth of embedment, maximum moment, and the tension in tie rod in case of using anchored sheet piles.</li><li>4. Analyse bearing capacity of soils under shallow footings.</li><li>5. Design shallow footings based on dimensions, thickness, area and length.</li><li>6. The basics for determining the bearing capacities of single piles.</li></ol> <p>Students will get acquainted to several geotechnical problems and documentation of geotechnical problems. Upon successful completion of the course, students should be able to apply fundamentals of foundation engineering and principles of geotechnical engineering</p>

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	in the analysis, design, and construction of civil engineering projects.
	The subject will give an introduction to:
<b>Course contents</b>	<ul style="list-style-type: none"><li>• Introduction to design according to EC 7</li><li>• Bearing capacity of foundations</li><li>• Excavation shoring methods</li><li>• Introduction to pile design</li><li>• Uplift and hydraulic failure</li><li>• Slope stability</li></ul>
	B. M. Das, "Principles of Geotechnical Engineering",  David F. McCarthy, "Essentials of Soil Mechanics and Foundations" Prentice Hall.  R. D. Holtz, W. D. Kovacs, and T. C. Sheahan "An introduction to Geotechnical Engineering", Prentice-Hall.
<b>Recommended literature</b>	Braja M. Das, Principles of Foundation Engineering, Sixth Edition, 2007.  C. Liu and J. B. Evett, "Soils and Foundations", Prentice Hall.  Donald, P. Coduto, Foundation Design Principles and Practices, Second Edition.  Bowles, Foundation Analysis and Design
<b>Teaching methods</b>	This course is a comprehensive course of integrating theory and practice. For each of the above topics students will <ul style="list-style-type: none"><li>• first understand the theoretical background (lecture),</li><li>• then the students get to solve a related problem (exercise),</li><li>• followed by practical application samples and further cases of using the theoretical background in practice</li></ul>
<b>Assessment method</b>	Written exam
<b>Language of instruction</b>	English
<b>Prerequisite</b>	Soil mechanics

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## Lean Management in Construction

<b>Course title</b>	Lean Management in Construction
<b>ECTS</b>	5
<b>Course type</b>	Lecture
<b>SWS</b>	4
<b>Semester</b>	Winter
<b>Workload in hours</b>	Total: 150 / In-class: 60 / Self-study: 90
<b>Lecturer</b>	Prof. Dr.-Ing. Gerd Maurer
<b>Course objectives</b>	Basic understanding of LEAN MANAGEMENT Application of Last Planner System ® for Construction
<b>Course contents</b>	Lectures on LEAN MANAGEMENT Introduction into the Last Planner System ® Method Workshops for practical usage of LEAN MANAGEMENT methods Lean Project Delivery Practices in Construction
<b>Recommended literature</b>	Ballard, G. (2000). <i>The last planner system of production control</i> . Birmingham, UK: University of Birmingham <i>Lean Project Delivery and Integrated Practices in Modern Construction</i> , Syed M. Ahmed, Lincoln H. Forbes, EAN: 9780429859342
<b>Teaching methods</b>	Lecture / presentation / practical work in case studies
<b>Assessment method</b>	Assignment - Paper
<b>Language of instruction</b>	English
<b>Prerequisite</b>	None

## Database Engineering

<b>Course title</b>	Database Engineering
<b>ECTS</b>	5
<b>SWS</b>	4
<b>Semester</b>	Winter and summer
<b>Workload in hours</b>	In-class: 60 hrs. / Self-study: 90 hrs / Total: 150 hrs
<b>Lecturer</b>	Prof. Dr. Dieter Rummler
<b>Course objectives</b>	<p>After this module students should</p> <ul style="list-style-type: none"> <li>• be able to describe the database design process,</li> <li>• know the elements of the Entity-Relationship-Model,</li> <li>• can build an Entity Relationship Model for a specific case,</li> <li>• can normalize a database design,</li> <li>• be able to manage a database through a database management system,</li> <li>• be able to query a database using SQL,</li> <li>• know the core components and functionalities of a database management system.</li> </ul>
<b>Recommended literature</b>	<p>Conolly, Thomas M.; Begg, Carolyn E.: Database Solutions - A step-by-step guide to building databases. 2nd Edition. Harlow, Essex: Pearson Education Limited, 2004</p> <p>Conolly, Thomas M.; Begg, Carolyn E.: Database systems - A practical approach to design, implementation, and management. 4th edition. Addison-Wesley, an imprint of Pearson Education, 2005</p>
<b>Teaching methods</b>	<p>Classes with exercises and practical training</p> <p>Course and document management through E-Learning System iLearn</p>
<b>Assessment method</b>	Written examination, 90 min.

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**Language of  
instruction**

English

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**Prerequisite**

Basics in Computer Science

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## AI Project

<b>Course title</b>	AI Project
<b>ECTS</b>	5
<b>Course type</b>	Project
<b>SWS</b>	2
<b>Semester</b>	Winter
<b>Workload in hours</b>	150 hours
<b>Lecturer</b>	Prof. Dr. Patrick Glauner
<b>Course objectives</b>	<p>The aim of this class is to provide students with hands-on and real-world AI development experience. They will have the opportunity to work on real data sets in order to solve real-world problems. As these projects are completed in groups, students will also have the opportunity to use professional software development tools for collaboration.</p>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>• Implementing high-tech projects in the fields of artificial intelligence, machine learning, computer vision, natural language processing and others.</li> <li>• Projects can be chosen for example from Kaggle, from other sources or be done in collaboration with an industrial partner.</li> <li>• Using modern high-end hardware, such as GPU clusters and cloud services.</li> <li>• Utilizing an agile process framework such as Scrum.</li> <li>• Understanding and using modern industrial software development tools such as work package trackers, code revision systems, debuggers, profilers and others.</li> <li>• Presenting R&amp;D outcomes to stakeholders at different levels, such as fellow students, faculty members, practitioners and executives.</li> </ul>

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<b>Recommended literature</b>	<ol style="list-style-type: none"><li>1. I. Goodfellow, Y. Bengio and A. Courville, "<b>Deep Learning</b>", MIT Press, 2016.</li><li>2. C. Larman, "<b>Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development</b>", Prentice Hall, third edition, 2004.</li><li>3. S. Chacon and B. Straub, "<b>Pro Git</b>", Apress, second edition, 2014.</li></ol>
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<b>Teaching methods</b>	Project
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<b>Assessment method</b>	Project
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<b>Language of instruction</b>	English
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<b>Prerequisite</b>	
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## Big Data

<b>Course title</b>	Big Data
<b>ECTS</b>	2.5
<b>Course type</b>	Lecture and seminar
<b>SWS</b>	2
<b>Semester</b>	Winter
<b>Workload in hours</b>	75 hours
<b>Lecturer</b>	Prof. Dr. Patrick Glauner
<b>Course objectives</b>	<p>The aim of this class is to provide students with an introduction to the field of big data. Students will acquire a solid foundation in how to design and implement big data systems. They will also learn hands-on how to use industrial big data tools. Furthermore, they will understand the limitations of big data-driven approaches and how they can recognize and solve typical issues in big data, such as data quality and biases. As an outcome, they will be able to work on real-world problems that not only require knowledge in AI, but also an expertise in how to use big data infrastructures, frameworks, libraries and tools.</p>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>• Introduction: 3 Vs, history of big data, selected big data use cases</li> <li>• Revision of database fundamentals: ER diagrams, relational databases, database management systems, queries, indexes, normalization, transactions</li> <li>• Big data architectures: distributed systems, MapReduce, CAP theorem, speedup through GPUs and FPGAs</li> <li>• Big data, small data, all data: data quality, biases in data sets, small sample size problems</li> <li>• Selected big data infrastructures, frameworks, libraries and tools</li> </ul>

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<b>Recommended literature</b>	<ol style="list-style-type: none"><li>1. A. Petrov, "<b>Database Internals: A Deep Dive into How Distributed Data Systems Work</b>", O'Reilly Media, 2019.</li><li>2. S. Sakr and A. Zomaya, "<b>Encyclopedia of Big Data Technologies</b>", Springer, 2019.</li><li>3. A. Tanenbaum and M. van Steen, "<b>Distributed Systems: Principles and Paradigms</b>", Pearson, 2nd edition, 2007.</li></ol>
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<b>Teaching methods</b>	Lecture and seminar
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<b>Assessment method</b>	Seminar presentation
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<b>Language of instruction</b>	English
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<b>Prerequisite</b>	
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## Computer Vision

<b>Course title</b>	Computer Vision
<b>ECTS</b>	5
<b>Course type</b>	Lecture and lab
<b>SWS</b>	4
<b>Semester</b>	Winter
<b>Workload in hours</b>	150 hours
<b>Lecturer</b>	Prof. Dr. Patrick Glauner
<b>Course objectives</b>	<p>The aim of this class is to discuss Computer Vision (CV), which allows computers to process visual inputs. We deal every day dozens of times with CV, such as facial recognition, real-time translating camera input or auto-tagging friends in photos. Modern CV algorithms are strongly based on machine learning methods, in particular deep neural networks. Students will acquire knowledge in CV and be able to elaborate it further in the future, for example in projects or further studies. Overall, CV is a cutting-edge field, with many high-pay opportunities for graduates.</p>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>• Introduction: applications, computational models for vision, perception and prior knowledge, levels of vision, how humans see</li> <li>• Pixels and filters: digital cameras, image representations, noise, filters, edge detection</li> <li>• Regions of images: segmentation, perceptual grouping, Gestalt theory, segmentation approaches, image compression</li> <li>• Feature detection: RANSAC, Hough transform, Harris corner detector</li> <li>• Object recognition: challenges, template matching, histograms, machine learning</li> <li>• Convolutional neural networks: neural networks, loss functions and optimization, backpropagation, convolutions and pooling, hyperparameters, AutoML, efficient training, selected architectures</li> </ul>

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	<ul style="list-style-type: none"><li>• Image sequence processing: motion, tracking image sequences, Kalman filter, correspondence problem, optical flow</li><li>• Foundations of mobile robotics: robot motion, sensors, probabilistic robotics, particle filters, SLAM</li><li>• Outreach: 3D vision, generative adversarial networks, self-supervised learning</li></ul>
<b>Recommended literature</b>	<ol style="list-style-type: none"><li>1. R. C. Gonzalez and R. Woods, "<b>Digital Image Processing</b>", Pearson, 3rd edition, 2018.</li><li>2. I. Goodfellow, Y. Bengio and A. Courville, "<b>Deep Learning</b>", MIT Press, 2016.</li></ol>
<b>Teaching methods</b>	Lecture and lab
<b>Assessment method</b>	Project
<b>Language of instruction</b>	English
<b>Prerequisite</b>	None

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## Innovation Management for Artificial Intelligence

<b>Course title</b>	Innovation Management for Artificial Intelligence
<b>ECTS</b>	3
<b>Course type</b>	Lecture and seminar
<b>SWS</b>	2
<b>Semester</b>	Winter
<b>Workload in hours</b>	90 hours
<b>Lecturer</b>	Prof. Dr. Patrick Glauner
<b>Course objectives</b>	<p>In recent years, plenty of companies have started to invest in AI in order to remain competitive. However, some 80% of AI project fail in reality. There is clearly an acute need in industry for experts that get the big picture of what needs to be done so that AI adds value to companies. This novel course addresses that need. Students will learn a number of challenges, both technical and managerial, that companies typically face when becoming AI-driven companies. They will also learn respective best practices along the entire data journey and how these lead to deployed applications that create real business value.</p>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>• Introduction: how AI is changing our society, selected examples of successful and unsuccessful AI projects and transformations</li> <li>• History and promises of AI: Dartmouth conference, AI from 1955 to 2011, AI winters</li> <li>• Deep learning era: breakthroughs, DeepMind, promises and hypes, no free lunch theorem, AI innovation in China, technological singularity</li> <li>• AI transformation of companies: opportunities, challenges, best practices</li> <li>• Case studies on how to turn companies into AI-driven companies</li> </ul>

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**Recommended literature**

1. P. Glauner and P. Plugmann (Eds.), "**Innovative Technologies for Market Leadership: Investing in the Future**", ISBN 978-3-030-41308-8, Springer, 2020.
  2. M. Iansiti and K. Lakhani, "**Competing in the Age of AI: Strategy and Leadership When Algorithms and Networks Run the World**", ISBN 978-1633697621, Ingram Publisher Services, 2020.
  3. K.-F. Lee, "**AI Superpowers: China, Silicon Valley, and the New World Order**", ISBN 9781328606099, Mariner Books, 2018.
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**Teaching methods**Lecture and seminar

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**Assessment method**Seminar presentation

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**Language of instruction**English

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**Prerequisite**

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## Selected Chapters of Control Engineering

<b>Course title</b>	Selected Chapters of Control Engineering
<b>Course ID</b>	CM-15/CM 2115 Master Electrical Engineering and Information Technology
<b>ECTS</b>	5 ECTS
<b>Course type</b>	Lecture/ practical exercises
<b>SWS</b>	4 SWS
<b>Semester</b>	Winter semester
<b>Workload in hours</b>	Contact hours: 60 h Self study: 90 h, including: Preparation and follow-up course work: 30 h exercises and preparation for examination: 60 h
<b>Lecturer</b>	Prof. Dr. Müller
<b>Course objectives</b>	<ul style="list-style-type: none"> <li>- Formulate dynamic systems in state space</li> <li>- Characterize typical behaviour</li> <li>- Judge what kinds of problems may be solved most suitably with what kinds of methods</li> <li>- Design of appropriate state space controllers and observers</li> <li>- Tuning of a Kalman Filter</li> <li>- Application of the theory to simulations</li> </ul>

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<b>Course contents</b>	<ul style="list-style-type: none"><li>- 1. Dynamic systems in state space</li><li>- 1.1 Setup of state equations</li><li>- 1.2 Properties (stability, controllability, observability)</li><li>- 2. Control design in state space</li><li>- 2.1 Pole assignment method (Ackermann Formula, modal controller, decoupling)</li><li>- 2.2 LQR controller</li><li>- 3. Observers</li><li>- 4. Time discrete systems in state space</li><li>- 5. Kalman Filter</li><li>- 5.1 Repetition of stochastics</li><li>- 5.2 Linear discrete time filter design</li></ul>
<b>Recommended literature</b>	<ul style="list-style-type: none"><li>- P. Albertos, S. Antonio: Multivariable Control Systems. Springer, 2004</li><li>- Z. Bubnicki: Modern Control Theory. Springer, 2005</li><li>- R.C. Dorf, R.H. Bishop: Modern Control Systems. 10th edition, Pearson Prentice Hall, Upper Saddle River, 2005</li><li>- B. Kisacanin, G.C. Agarwal: Linear Control Systems. Springer, 2002</li><li>- K. Ogata: Modern Control Engineering. 4th edition, Pearson Prentice Hall, Upper Saddle River, 2002</li></ul>
<b>Teaching methods</b>	Lectures with blackboard and beamer "group puzzle" method for chapters 1 and 2 PC simulations using Matlab/Simulink
<b>Assessment method</b>	Written examination, 90 min.
<b>Language of instruction</b>	English
<b>Prerequisite</b>	knowledge of the contents: <ul style="list-style-type: none"><li>- Mathematics: Linear algebra, Laplace transformation, z-Transformation, statistics</li><li>- Control: Understanding of dynamic systems, description of dynamic systems in state space</li></ul>

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## Computer Science II

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<b>Course title</b>	Applied Computer Science II
<b>Course ID</b>	F3102 (Informatik 2)
<b>ECTS</b>	5
<b>Course type</b>	Lectures with exercises
<b>SWS</b>	4
<b>Semester</b>	Winter semester
<b>Workload in hours</b>	In-class: 45h / Self study: 105 / Total: 150
<b>Lecturer</b>	Prof. Dr. Faber

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**Course objectives**

The course "computer science 2" is part of the module "applied computer science" which is suitable for media technology students. In this course, the students gain first insights in software development techniques and processes using a high level programming language (HLL, e.g., Java). They will learn the concepts of data retention in volatile and non-volatile memory, of variables, data structures and functions. They will be taught to understand the concepts of object oriented programming (classes, objects) and will be capable of implementing small programs in a high level language according to a given specification. They will also learn to analyze and remove bugs that may appear during the development process.

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<b>Recommended literature</b>	<p><i>Java ist auch eine Insel</i>; Christian Ullenboom; Galileo Press; 8. Auflage; 2009</p> <p><i>Thinking in Java</i>; Bruce Eckel; Prentice Hall; 4<sup>th</sup> Edition; 2006</p> <ul style="list-style-type: none"><li>• <i>Informatik – Eine grundlegende Einführung</i>; Manfred Broy; Springer; Berlin [u.a.]; 2. Auflage; 1998 (Bd. 1 bzw. 2)</li><li>• Further literature and online resources as supplied during the course.</li></ul>
<b>Teaching methods</b>	Seminar/ lectures with excercises
<b>Assessment method</b>	written examination, 90 min.
<b>Language of instruction</b>	English
<b>Prerequisites</b>	Recommended (not compulsory!): Computer Science I  Technically oriented background courses, supplying basic knowledge about programming and system design, would be beneficial.

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## Advanced Circuits Lab

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<b>Course title</b>	Advanced Circuits Lab
<b>ECTS</b>	5
<b>Course type</b>	Practical Exercises
<b>SWS</b>	4
<b>Semester</b>	Winter and summer
<b>Workload in hours</b>	Total: 150 / In-class: 60 / Self-study: 90
<b>Lecturer</b>	Prof. Dr. Werner Bogner
<b>Course objectives</b>	Ability to analyze and apply analog semiconductor circuits. Ability to design simple analog semiconductor circuits.
<b>Course contents</b>	<ul style="list-style-type: none"><li>• Lessons for introduction of specific topics<ul style="list-style-type: none"><li>- Applications of analog circuits</li><li>- Diodes and Transistors</li><li>- Amplifiers</li><li>- RF circuits (Oscillators, PLL)</li></ul></li><li>• Lab Experiments<ul style="list-style-type: none"><li>- Introduction to basic electronics measurement equipment</li><li>- Diode circuits: voltage doubler (Villard and Greinacher circuit), voltage cascade, diode as switch</li><li>- Integrated circuits: Timer circuit</li><li>- Design of AF-amplifier according to specification</li><li>- Differential amplifier: Characteristics, current source, application</li><li>- Quasi-linear AF-power-amplifier: Class A, B, AB operation, biasing, output power, efficiency</li><li>- Switch mode AF power amplifier: Class D</li><li>- Phase locked loop – PLL</li></ul></li></ul>

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	<ul style="list-style-type: none"><li>- RF-Oscillators: Phase-shift oscillator, Wien-bridge oscillator, Colpitts-oscillator, LC-oscillators, Franklin-oscillator</li><li>- Nonlinear RF-circuit simulation using AWR Microwave office</li><li>- RF-measurements: S-Parameter and time domain reflectometry</li></ul>
<b>Recommended literature</b>	Tietze, Schenk: Electronic Circuits: Handbook for Design and Application, Springer 2nd ed. 2008
<b>Teaching methods</b>	Practical work and some lessons for introduction of specific topics
<b>Assessment method</b>	Written examination (90 min.) or examination assignment (seminar paper)
<b>Language of instruction</b>	English
<b>Prerequisite</b>	Basic knowledge of solid state devices (bipolar junction transistors, diodes) Basics of electronic networks <b>Admission test!</b>

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## Batteries and Supercaps

<b>Course title</b>	Batteries and Supercapacitors
<b>ECTS</b>	5
<b>Course type</b>	Lecture
<b>SWS</b>	4
<b>Semester</b>	Winter and summer
<b>Workload in hours</b>	Total: 150 / In-class: 60 / Self-study: 90
<b>Lecturer</b>	Prof. Dr.techn. Michael Sternad
<b>Course objectives</b>	Introducing the participant to the chemistry and technology of electrochemical power sources.
<b>Course contents</b>	Understanding the working principles, the function of involved active materials and the application of important present and potential future electrochemical power sources like e.g. alkaline-, lead-acid-, nickel-metal hydride- and lithium-ion batteries as well as electrochemical supercapacitors.
<b>Recommended literature</b>	Reddy, T. B.; Linden, D., Linden's Handbook of Batteries, 4th ed. Reddy, 2011. Hamann, C.; Vielstich, W., Elektrochemie, Wiley, 1997.
<b>Teaching methods</b>	Lesson
<b>Assessment method</b>	Written examination, 90 min.
<b>Language of instruction</b>	English
<b>Prerequisite</b>	None

## Introduction to the Finite Element Method

<b>Course title</b>	Introduction to the Finite Element Method with NASTRAN & PATRAN
<b>ECTS</b>	4
<b>Course type</b>	Lectures with workshops
<b>SWS</b>	4
<b>Semester</b>	Winter and summer
<b>Workload in hours</b>	Total: 120 / in-class: 40 / Self-study: 80
<b>Lecturer</b>	Prof. Dr. Christian Bongmba
<b>Course objectives</b>	The main aim is to introduce students to the direct stiffness method. They learn how to derive the stiffness matrices for springs, bars, beams, two- and three-dimensional finite elements. The workshops introduce students to MSC NASTRAN and PATRAN. Students learn how to use PATRAN for pre- and post-processing and NASTRAN as a solver. They learn how to import geometry into PATRAN, carry out the discretization, define material and section properties and boundary conditions and set up a finite element analysis.
<b>Course contents</b>	<ol style="list-style-type: none"> <li>1. Introduction – What is the Finite Element Method?</li> <li>2. Discretization examples</li> <li>3. Development of truss element</li> <li>4. Development of beam element</li> <li>5. Two-dimensional elements</li> <li>6. Three-dimensional elements</li> <li>7. Workshops with MSC NASTRAN und PATRAN linear static, normal modes and buckling</li> </ol>
<b>Recommended literature</b>	Logan, Daryl L.: A First Course in the finite Element Method, CENGAGE Learning 2012.



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<b>Teaching methods</b>	Lectures, workshops and videos
<b>Language of instruction</b>	English
<b>Prerequisite</b>	Statics, Strength of Materials

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## Engineering Mechanics 3: Dynamics

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<b>Course title</b>	Engineering Mechanics 3: Dynamics
<b>ECTS</b>	5
<b>Course type</b>	Lectures with tutorials
<b>SWS</b>	4
<b>Semester</b>	Summer
<b>Workload in hours</b>	Total: 150 / In-class: 45 / Self-study: 105
<b>Lecturer</b>	Prof. Dr. Christian Bongmba
<b>Course objectives</b>	<p>The main aims of the course are:</p> <p>For the students to understand the effect of forces and moments on the motion of mechanical systems.</p> <p>For them to be able to mathematically describe the motion of a particle and a rigid body in an inertial as well as in a moving frame.</p> <p>For the students to have a good understanding of the laws and principles of dynamics (Newton's second law, Newton-Euler equations, d'Alembert's principle, work-energy theorem) and to be able to formulate these laws mathematically.</p> <p>For them to be able to derive the equations of motion of a particle or a rigid body using the laws and principles of dynamics.</p> <p>For the students to understand how to create mechanical models of technical systems and to use dynamics in solving problems related to these technical systems.</p>
<b>Course contents</b>	<ul style="list-style-type: none"><li>• Kinematics of a Particle</li><li>• Laws of Dynamics</li><li>• Dynamics of a Particle</li><li>• Relative Motion</li><li>• General Motion of a Rigid Body</li></ul>

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- Rigid Bodies in Plane Motion
  - Elementary Impact Dynamics
  - Mechanical Vibrations
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**Recommended literature**

Dietmar Gross, Werner Hauger, Jörg Schröder, Wolfgang Wall, Sanjay Govindjee: Engineering Mechanics 3, Dynamics. Springer, 2011, ISBN: 9783642140198

Hibbeler, Russell C: Engineering Mechanics: Dynamics. 12th ed. Prentice Hall, 2009. ISBN: 9780136077916.

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**Teaching methods**

Lectures and Tutorials

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**Assessment method**

Written examination, 90 min.

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**Language of instruction**

English

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**Prerequisite**

- Calculus
  - Statics
  - Mathematics
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## Design Methodology/CAD

<b>Course Title</b>	Design Methodology/CAD
<b>ECTS</b>	3
<b>Course type</b>	Lecture with the conduction of CAD project
<b>SWS</b>	2
<b>Semester</b>	Winter and summer
<b>Workload in hours</b>	Total: 90 / In-class: 30 / Self-study: 60
<b>Lecturer</b>	Prof. Dr.-Ing. Karl Hain
<b>Course Objectives</b>	Students are able to apply design methods and rules systematically for product development, especially in the earlier design stages, using CAD for the depiction of solutions.
<b>Course Contents</b>	<ul style="list-style-type: none"> <li>• Introduction to basics</li> <li>• Methodology of the design process</li> <li>• Conceptual design <ul style="list-style-type: none"> <li>○ Analysis and requirements</li> <li>○ Functional analysis, function structures and logical considerations</li> <li>○ Aids and methods for finding solutions</li> </ul> </li> <li>• Evaluation and selection</li> <li>• Rules and principles for embodiment design</li> <li>• TRIZ techniques</li> <li>• Design examples with CAD</li> </ul>
<b>Recommended Literature</b>	Pahl, Beitz et. al.: Engineering Design: A Systematic Approach, 3 <sup>rd</sup> Edition, Springer 2007, ISBN: 978-1-84628-318-5
<b>Teaching Methods</b>	Lecture with integrated product development example with CAD
<b>Assessment Methods</b>	Written examination, 90 min.
<b>Prerequisite</b>	Basics of design and CAD

## Introduction to Solidworks (CAD)

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<b>Course title</b>	Introduction to Solidworks (CAD)
<b>ECTS</b>	3
<b>Course type</b>	Lecture with CAD exercises
<b>SWS</b>	2
<b>Semester</b>	Winter and summer
<b>Workload in hours</b>	Total: 90 / In-class: 30 / Self-study: 60
<b>Lecturer</b>	Prof. Dr.-Ing. Karl Hain
<b>Course Objectives</b>	Students are able to apply Solidworks CAD system for product development
<b>Course Contents</b>	<ul style="list-style-type: none"><li>• Overview and menus</li><li>• Sketch elements, tolerance, dimensioning</li><li>• Modeling single parts</li><li>• Modeling assemblies</li><li>• Modeling welded parts</li><li>• Simulations</li></ul>
<b>Teaching Methods</b>	Supervised CAD exercises at PCs
<b>Assessment Method</b>	Written examination, 90 min.
<b>Language of Instruction</b>	English
<b>Prerequisite</b>	Basics of design and product development

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## Advanced Solidworks (CAD)

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<b>Course title</b>	Advanced Solidworks (CAD)
<b>ECTS</b>	3
<b>Course type</b>	Practical exercises with CAD system Solidworks
<b>SWS</b>	2
<b>Semester</b>	Winter and summer
<b>Workload in hours</b>	Total: 90 / In-class: 30 / Self-study: 60
<b>Lecturer</b>	Prof. Dr.-Ing. Karl Hain
<b>Course objectives</b>	Students are able to apply Solidworks CAD system for more complex product development
<b>Course contents</b>	<ul style="list-style-type: none"><li>• Loft boss/base techniques</li><li>• Spline functions</li><li>• Surface modelling tools and techniques</li><li>• Sheet metal parts</li><li>• Advanced mechanical mates for assemblies</li></ul>
<b>Recommended literature</b>	Solidworks online help
<b>Teaching methods</b>	CAD exercises / practical work
<b>Assessment method</b>	Written examination, 90 min.
<b>Language of instruction</b>	English
<b>Prerequisite</b>	Basic knowledge of design and product development

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## Additive Manufacturing – more than 3D Printing

<b>Course title</b>	Additive Manufacturing – more than 3D Printing
<b>ECTS</b>	2
<b>Course type</b>	Lecture
<b>SWS</b>	2
<b>Semester</b>	Summer
<b>Workload in hours</b>	Total: 60 / In-class: 30 / Self-study: 30
<b>Lecturer</b>	Prof. Dr. Christian Wilisch
<b>Course objectives</b>	The students learn about the basic concepts and about the most common methods of additive manufacturing
<b>Course contents</b>	Basic principles of additive manufacturing (AM); AM from the solid, liquid and gaseous phase
<b>Recommended literature</b>	Andreas Gebhardt, A. and Hötter, J.-S.; Additive Manufacturing; Hanser, 2016 (this book is useful, but not required for the class)
<b>Teaching methods</b>	Lectures
<b>Assessment method</b>	Written paper and presentation in class
<b>Language of instruction</b>	English
<b>Prerequisite</b>	None

## Introduction to Quality Management

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<b>Course title</b>	Introduction to Quality Management
<b>ECTS</b>	4
<b>Course type</b>	Lecture
<b>SWS</b>	3
<b>Semester</b>	Winter and summer
<b>Workload in hours</b>	Total: 60 / In-class: 30 / Self-study: 30
<b>Lecturer</b>	Prof. Dr. Christian Wilisch
<b>Course objectives</b>	<p>Quality management (QM) is an indispensable tool not only in production environments but in all aspects of commerce. This course aims to provide students with basic knowledge about QM techniques and their applications.</p>
<b>Course contents</b>	<ul style="list-style-type: none"><li>• What is 'quality'?</li><li>• Historical context of quality management</li><li>• Financial aspects of quality management</li><li>• Quality techniques and their applications</li><li>• Process control techniques</li></ul>
<b>Recommended literature</b>	<ul style="list-style-type: none"><li>• Imai, Masaaki: Gemba Kaizen, 2nd ed., McGraw-Hill, New York, 2012</li><li>• Chalkiadakis, Ioannis: New Product Development with the Use of Quality Function Deployment, Lambert, Mauritius, 2019</li><li>• Montgomery, Douglas C.: Introduction to Statistical Quality Control, Wiley, New York, 2019</li></ul>
<b>Teaching methods</b>	Lectures with discussions and presentations
<b>Assessment method</b>	Written paper to be presented in class

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<b>Language of instruction</b>	English
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<b>Prerequisite</b>	None
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## Customer-driven Production Planning

<b>Course title</b>	Customer-driven Production Planning (in the smart factory)
<b>ECTS</b>	2
<b>Course type</b>	Lecture/ practical exercises
<b>SWS</b>	2
<b>Semester</b>	Winter Semester
<b>Workload in hours</b>	Total: 60 hrs / In-class:30 hrs / Self-study: 30 hrs
<b>Lecturers</b>	Prof. Dr. Christine Wünsche
<b>Course objectives</b>	Basic understanding of the interaction between design, material, production technology and quality assurance in the production of a medical product
<b>Course contents</b>	Customer and customer demands What is quality? Materials, design and production technology Quality control: measuring, quality planning, Industry 4.0
<b>Recommended literature</b>	Optical Technology von Jens Bliedtner, Gunter Grafe und Rupert Hector von McGraw Hill Book Co
<b>Teaching methods</b>	Lecture, hands-on training
<b>Assessment method</b>	Written examination, 90 min.
<b>Language of instruction</b>	English
<b>Prerequisite</b>	Basic engineering knowlegde, physics

## Projects in Science and Engineering

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<b>Course title</b>	Projects in Science and Engineering
<b>ECTS</b>	6
<b>Course type</b>	Project
<b>SWS</b>	4
<b>Semester</b>	Winter and summer
<b>Workload in hours</b>	180
<b>Lecturer</b>	Prof. Dr. Thomas Stirner
<b>Course objectives</b>	Knowledge of project management; analysis, distribution and solution of the tasks in a small team; obtaining and presenting results; practical application of the theoretical knowledge base; communication and team skills; strategic planning; time-management skills; problem-solving skills
<b>Course content</b>	Projects or part of a project may be of a theoretical nature (e.g. literature review, software development, data mining, etc.) or of an experimental nature (e.g. design of experiment, measurements, etc); project descriptions will be made available at the beginning of the semester; teams will be built to solve the tasks; each team will work on project results, which will be presented in written form and orally
<b>Recommended literature</b>	Specific to the project
<b>Teaching methods</b>	Supervision
<b>Assessment method</b>	Written report and oral presentation

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<b>Language of Instruction</b>	English
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<b>Prerequisite</b>	None
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## Advanced Projects in Science and Engineering

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<b>Course title</b>	Advanced Projects in Science and Engineering
<b>ECTS</b>	6
<b>Course type</b>	Project
<b>SWS</b>	4
<b>Semester</b>	Winter and summer
<b>Workload in hours</b>	180
<b>Lecturer</b>	Prof. Dr. Thomas Stirner
<b>Course objectives</b>	Deeper knowledge of project management; further analysis, distribution and solution of advanced tasks in a small team; obtaining and presenting results; extensive practical application of the theoretical knowledge base; enhanced communication and team skills; strategic planning; time-management skills; problem-solving skills
<b>Course content</b>	Advanced projects or part of an advanced project may be of a theoretical nature (e.g. literature review, software development, data mining, etc.) or of an experimental nature (e.g. design of experiment, measurements, etc.); project descriptions will be made available at the beginning of the semester; teams will be built to solve the advanced tasks; each team will work on project results, which will be presented in written form and orally
<b>Recommended literature</b>	Specific to the project
<b>Teaching methods</b>	Supervision

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**Assessment method**      Written report and oral presentation

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**Language of  
Instruction**                  English

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**Prerequisite**                Projects in Science and Engineering

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## Projects in Industrial Engineering

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<b>Course title</b>	Projects in Industrial Engineering
<b>ECTS</b>	6
<b>Course type</b>	Project
<b>SWS</b>	4
<b>Semester</b>	Winter and summer
<b>Workload in hours</b>	180
<b>Lecturer</b>	Prof. Dr. Jutta Stirner
<b>Course objectives</b>	Knowledge of project management; analysis, distribution and solution of the tasks in a small team; obtaining and presenting results; practical application of the theoretical knowledge base; communication and team skills; strategic planning; time-management skills; problem-solving skills.
<b>Course content</b>	Projects or part of a project may be of a theoretical nature (e.g. literature review, data mining, etc.) or of analytical nature (e.g. business plan, etc.); project descriptions will be made available at the beginning of the semester; teams will be built to solve the tasks; each team will work on project results, which will be presented in written form.
<b>Recommended literature</b>	Specific to the project
<b>Teaching methods</b>	Supervision
<b>Assessment method</b>	Written report

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<b>Language of instruction</b>	English
<b>Prerequisite</b>	None
<b>Miscellaneous</b>	Max. 10 participants

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## 3D Displays

<b>Course title</b>	3D Displays
<b>ECTS</b>	2
<b>Course type</b>	Lecture
<b>SWS</b>	2
<b>Semester</b>	Winter and summer
<b>Workload in hours</b>	Total: 60 / In-class: 30 / Self-study: 30
<b>Lecturer</b>	Prof. Dr. Gerald Fütterer
<b>Course objectives</b>	<p>The use of 3D data acquisition and its visualization plays an increasing role e.g. in industrial measurements, medical examinations, engineering and biological science.</p> <p>The lecture explains basic approaches used within the plurality of existing 3D display technologies. Pros and cons are discussed in regards to discrete applications and embodiments.</p>
<b>Course contents</b>	<ul style="list-style-type: none"> <li>• Physiological aspects of 3D viewing</li> <li>• Stereoscopic displays</li> <li>• Auto-stereoscopic displays</li> <li>• Volumetric displays</li> <li>• Light field displays</li> <li>• Integral imaging</li> <li>• 3D projection displays</li> <li>• HMD, HUD</li> <li>• Classic holographic 3D displays</li> <li>• Holographic 3D with limited space</li> <li>• bandwidth</li> <li>• Data representation</li> <li>• Eye tracking</li> </ul>
<b>Recommended literature</b>	Ernst Lueder, „3D Displays“, ISBN:978-1-119-99151-9, Wiley 2012, UK

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**Teaching methods**      Lecture, script on blackboard, projector

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**Assessment method**      Written examination, 90 min.

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**Language of instruction**      English

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**Prerequisite**      None

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## International Business Development

<b>Course title</b>	International Business Development
<b>Course ID</b>	A3111
<b>ECTS</b>	5
<b>SWS</b>	4
<b>Semester</b>	Winter
<b>Workload in hours</b>	Total: 150 / In-class: 60 hrs / Self-study: 90 hrs
<b>Lecturer</b>	Mr. Jack Romero
<b>Course objectives</b>	<p>The course is for students interested in starting their own businesses or focusing on international business development. The aim is to prepare students with skills involved in launching and leading businesses but also to use those skills to develop and run businesses or business units with a direction toward innovation, international expansion and growth. Students gain theoretical insights with practical applications in a learning environment characterized by active participation, both individually and in groups.</p>
<b>Course contents</b>	<p>Perspectives on Strategy:</p> <ul style="list-style-type: none"> <li>• Strategic thinking from both an internal and external perspective.</li> <li>• Foundations of strategy and strategic perspectives</li> <li>• Strategies for innovation, product, process, organization, marketing</li> </ul> <p>Entrepreneurship and Business Growth</p> <ul style="list-style-type: none"> <li>• Maintaining entrepreneurial drive</li> <li>• Government partnering</li> <li>• Turnaround strategies</li> </ul> <p>Managing Networks and Internationalisation</p> <ul style="list-style-type: none"> <li>• How to develop business capabilities through internationalization and networking</li> <li>• Building, maintaining and supporting businesses with various modes of foreign operations</li> </ul>

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	<ul style="list-style-type: none"><li>• Meeting competition from existing incumbents as well as new entrants</li><li>• Balancing cooperation and competition</li></ul> Strategizing in Business Development <ul style="list-style-type: none"><li>• Participation in a real-life strategic process</li><li>• Acting based on assembled knowledge</li><li>• Developing a business idea</li></ul>
<b>Teaching methods</b>	<ul style="list-style-type: none"><li>• Lectures</li><li>• Group work</li><li>• Case studies</li><li>• Learning based on experiences</li><li>• Exercises</li></ul>
<b>Recommended literature</b>	Exploring strategy Angwin Duncan, Johnson Gerry, Regner Patrick, Scholes Kevan, Whittington Richard Tenth edition. : Harlow : Pearson :2014 ISBN: 9781292002552 (pbk.)  International Business Expansion Anthony Gioli Over And Above Press: 2014 ISBN: 978-0989091749
<b>Assessment method</b>	written paper
<b>Language of instruction</b>	English

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## Financing and Marketing for New Ventures

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<b>Course title</b>	Finance and Marketing New Ventures
<b>ECTS</b>	5
<b>Course type</b>	Lecture/ practical exercises
<b>SWS</b>	4
<b>Semester</b>	Winter
<b>Workload in hours</b>	Total: 150 / In-class: 60 / Self-study: 90
<b>Lecturer</b>	Prof. Dr. Jürgen Sikorski, Jason Johnson
<b>Course objectives</b>	Learn how to market an innovation-based new venture to investors and to the users of its products.
<b>Course contents</b>	<ul style="list-style-type: none"><li>• Start-up financing theory &amp; practice</li><li>• What do you need to get started?</li><li>• Review of the different financing vehicles.</li><li>• The structure of a business plan and what is relevant for investors.</li><li>• How to estimate your funding needs.</li><li>• How to create a budget when the future is unknown</li><li>• What are the basic financial statements and how do you create them?</li><li>• How to manage founder dilution of shares.</li><li>• Group project involving estimating funding needs.</li></ul>
<b>Teaching methods</b>	Lesson/Group Project/Case Studies/Exercises
<b>Assessment method</b>	Written Paper
<b>Language of instruction</b>	English
<b>Prerequisite</b>	Basic knowledge of the subject field

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