DEGGENDORF INSTITUTE OF TECHNOLOGY

Course Descriptions General Engineering – Winter Semester 2023/24

25 September 2023

German A1/ Parts 3 and 4

Course title	German A1/ Parts 3 and 4
ECTS	4
Course type	Course with exercises
SWS	4
Semester	Winter and Summer
Workload in hours	60 hrs
Lecturer	Dr. Virginia Wallner
Course objectives	• Can understand and use familiar expressions and very basic phrases aimed at meeting concrete everyday needs • Can introduce themselves and others and ask other people questions about their person • Can communicate in a simple way if the other person speaks slowly and clearly and is willing to help http://www.europaeischer-referenzrahmen.de
Course contents	• Grammar – Prepositions – Possessives – Dative verbs – The imperative-Simple past 'war/ hatte' – The perfect form – Word formation – Subjunctive II • Topics – Apartments and houses – Parts of the body – Describing people and their character – Household activities – Weather – Holidays and celebrations

Recommended literature	Menschen. Deutsch als Fremdsprache. Kursbuch A1.2 Hueber. Kapitel 13-24 ISBN 978-3-19-561901-1 Menschen. Deutsch als Fremdsprache. Arbeitsbuch A1.2 mit Audio-CD. Hueber. Kapitel 13-24 ISBN 978-3-19-511901-6
Teaching methods	• Partner and group work • Explanation of topics by the lecturer • Presentations and discussions • Feedback from the lecturer • Listening exercises
Assessment method	Written examination, 90 min.
Language of instruction	German
Prerequisites	Successful completion of Level A1/Parts 1 and 2 (88121)

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

English in Technical Contexts B2

Course title	English in Technical Contexts B2
ECTS	2
Course type	Language training course
SWS	2
Semester	Winter and summer
Course level	**B2** • Can understand the main ideas of complex text on both concrete and abstract topics, including technical discussions in his/her field of specialization • Can interact with a degree of fluency and spontaneity that makes regular interaction with native speakers quite possible without strain for either party • Can produce clear, detailed text on a wide range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options http://www.europaeischer-referenzrahmen.de/
Lecturer	Neal O'Donoghue, MA
Course objectives	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. The course is designed to be relevant and interesting for engineering students and will be adapted to their learning needs and study areas. 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.

Course contents	*Obligatory topics (60 %):* • Numbers and mathematical operations • Shapes and dimensions • August 2017 • 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 (40 %):* 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) No dictionaries are allowed. Exam structure: • Part 1: Listening comprehension(s) • 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 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> (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
Prerequisites	B1 / Abitur (A-levels/ school leaving certificate giving right of entry to higher education) / 7-9 years of English

Intercultural Training for Germany and Bavaria

Course title	Intercultural Training for Germany and Bavaria
ECTS	1
Course type	Elective
SWS	1
Semester	Winter and summer
Workload in hours	30 hours
Name of Instructor	Lisa Werner
Course objectives	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.
Course contents	I. Culture (theroies) II. Customs and Rituals in Germany/Bavaria III. Information on Germany and Bavaria and the DIT IV. Quiz and Presentation V. Culture Shock
Recommended literature	Bolten J. und Ehrhardt C., Interkulturelle Kommunikation, Verlag Wissenschaft & Praxis 2003; Bolten J, Einführung in die interkulturelle Wirtschaftskommunikation, Vandenhoeck & Ruprecht 2007
Teaching methods	The course is organized according to four pillars: 1. Culture 2. Customs and Rituals 3. Information on Germany/Bavaria 4. Culture Shock

	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.
Assessment method	Paper
Language of instruction	English/German
Prerequisites	None

Basics of International Sales and Business Development

Course title	Basics of International Sales and Business Development
Course ID	268
ECTS	2
Course type	Lecture with group work and presentations
SWS	2
Semester	Winter and summer
Lecturer	Ibrahim Waked
Course objectives	General knowledge of international sales and strategic business development mechanisms. As well as profound analysis of practical case studies.
Course contents	• Basics of sales and business development • Analysis of market potential including cultural & political aspects, correlation between microeconomic and demographic aspects, (PESTELO analysis) • Relevancy of world bank reports on general economic performance and their implementation in company BD strategy • Market entry and risk management
Recommended literature	**Strategic Management** by Richard Lynch von Pearson Longman **Business Development Management** By Lutz Becker, Walter Gora, Tino Michalski
Teaching methods	Lecture with integrated project development examples
Assessment method	Presentation and seminar paper
Language of instruction	English

Bavarian Culture

Course title	Bavarian Culture
Course ID	229
SWS	2
Semester	Winter and summer
ECTS	2
Course type	Elective
Language of instruction	English
Name of lecturer	Manuela Krawagna-Nöbauer
Course objectives	Participants get a deeper understanding of the traditional and contemporary Bavarian culture by integrating knowledge about customs, language, and history with culturally routed events.
Course contents	1. Hard facts 1.1. History 1.2. Demographics 1.3. Geography 2. Customs and rituals 2.1. Traditional 2.2. Contemporary 3. Language 4. Events
Teaching methods	The course is organized according to four pillars: 1. Hard Facts 2. Customs and Rituals 3. Language 4. Events 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 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.
Recommended literature	Jonas, B., Gebrauchsanweisung für Bayern, Piper Verlag, 2007
Assessment methods	Seminar paper
Prerequisites	Participants should have attended the introductory Intercultural Training during the Orientation Week.

Business Storytelling

Course title	Business Storytelling
Course ID	296
ECTS	2
Course type	Elective
SWS	2
Semester	Winter and summer
Workload in hours	Total: 60 / In-class: 30 / Self-study: 30
Lecturers	Raphael Fiche
Course objectives	At the end of this course, students will be able to: • Recognize key elements that go into persuasive storytelling • Identify types of stories and their purposes • Create compelling stories to achieve business goals • Apply acquired knowledge to develop a compelling story to persuade others to think or act in a different way.
Course contents	• Introduction to Business Storytelling • Power of Business Stories: when and why to tell them • Types of Business Stories and Their Purposes • Structuring Your Story to Engage the Audience • Storytelling techniques • Enhance Your Storytelling Skills
Recommended literature	Janis Forman (2013), Storytelling in Business: The Authentic and Fluent Organization Seth Godin(2005), All Marketers Are Liars

Teaching methods	• Lectures • Group work • Case studies • Presentation • Exercises
Assessment method	Class workshops / presentation / case studies / seminar paper
Language of instruction	English
Prerequisites	None

Cross-Cultural Team Building

Course title	Cross-Cultural Team Building Workshop
Lecturer	Prof. Dr. Johann Nagengast
Course type	Elective
SWS	2
Semester	Winter and summer
ECTS	2
Assessment method	Seminar paper
Course language	English
Course objectives	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. 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. 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 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, 2nd. Ed., Buckingham, 2003; Buchanan, D., Huczynski, A.: Organizational Behavior, 5th 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
Miscellaneous	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.

Simplified Microcontroller Programming

Course title	Simplified Microcontroller Programming
ECTS	2
Course type	Lecture with practical exercises
SWS	2
Semester	Winter and summer
Workload in hours	Total: 60 / In-class: 30 / Self-study: 30
Lecturer	Johann Gerner
Course objectives	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.
Course contents	• Introduction: presentation of the development system Arduino and its sub-systems • Testing and analysis of existing sample programs under consideration of special problem cases • Reading and implementing Fritzing diagrams and wiring diagrams • Inclusion and application of external program libraries • Application programming of different sensors and their characteristics • Control of different actuators and introduction to the applied technology

	• Program development for simple measurement and control applications • Information about current development trends in microcontroller engineering
Recommended literature	Massimo Banzi, Arduino für Einsteiger (2012); O'Reilly Simon Monk, Programming Arduino Next Steps: Going Further with Sketches
Teaching methods	Seminar-like lessons and practical tasks in the laboratory
Assessment method	Presentation of project results
Language of instruction	English
Prerequisites	Fundamentals of Informatics, experience with Windows

Introduction to Soil Mechanics

Course title	Introduction to Soil Mechanics
ECTS	3
Course type	Lecture and exercises Presentations Discussion
SWS	2
Semester	Winter and summer
Lecturer	Prof. Dr.-Ing. Parviz Sadegh Azar
Course objectives	The objective of this course is to introduce the subject of soil mechanics and provide the basics of geotechnical engineering. 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. 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.
Course contents	The subject will give an introduction to: • Classification of soil materials • Stresses and strain in soil • Shear strength of soil • Lateral earth pressure • Primary settlement of soil and calculations • Slope stability • Bearing capacity of foundations • Uplift and hydraulic failure

Recommended literature	R.F. Craig. "Soil Mechanics", Van Nostrand Reinhold Company. B. M. Das, "Principles of Geotechnical Engineering", PWS-KENT. 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. T. W. Lambe and R. V. Whitman, "Soil Mechanics", John Wiley & Sons, Inc. C. Liu and J. B. Evett, "Soils and Foundations", Prentice Hall. S. Prakash, "Fundamentals of Soil Mechanics", S.P. Foundation K. Terzaghi and R. B. Peck, "Soil Mechanics in Engineering Practice", John Wiley & Sons, Inc.
Teaching methods	This course is a comprehensive course of integrating theory and practice. For each of the above topics students will • first understand the theoretical background (lecture), • then the students get to solve a related problem (exercise), • followed by practical application samples and further cases of using the theoretical background in practice
Assessment method	Written examination, 90 min.
Language of instruction	English
Prerequisites	Mathematics

Introduction to Geotechnical Engineering

Course title	Introduction to Geotechnical engineering
ECTS	3
Course type	Lecture and exercises Presentations Discussion
SWS	2
Semester	Winter and summer
Lecturer	Prof. Dr.-Ing. P. Sadegh Azar
Course objectives	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 according to European standards (EC 7). Some of the important topics that students will learn during the course: 1. Analyse earth retaining structures to determine active, passive and at rest lateral earth pressures (and associated forces). 2. Design the dimensions of retaining gravity and cantilever walls and assess the stability of these designed walls. 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. 4. Analyse bearing capacity of soils under shallow footings. 5. Design shallow footings based on dimensions, thickness, area and length. 6. The basics for determining the bearing capacities of single piles. 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 in the analysis, design, and construction of civil engineering projects.
Course contents	The subject will give an introduction to: • Introduction to design according to EC 7 • Bearing capacity of foundations • Excavation shoring methods • Introduction to pile design • Uplift and hydraulic failure • Slope stability
Recommended literature	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. 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
Teaching methods	This course is a comprehensive course of integrating theory and practice. For each of the above topics, students will • first understand the theoretical background (lecture), • then the students get to solve a related problem (exercise), • followed by practical application samples and further cases of using the theoretical background in practice
Assessment method	Written examination, 90 min.
Language of instruction	English
Prerequisites	Soil mechanics

Lean Management

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

Introduction to Public-Key Cryptography

Course title	Introduction to Public-Key Cryptography
ECTS	3
Course type	Lecture
SWS	2
Semester	Winter
Workload in hours	Total: 60
Lecturer	Prof. Dr. Peter Ullrich
Course objectives	This is an introductory course to cryptography with a focus on Public-Key Ciphers. No prerequisites in elementary number theory are required. The RSA-Algorithm is studied in detail and divers secure applications are considered.
Course contents	Basics and History, Elementary Number Theory, Public-Key Cyphers, Applications, Programming.
Recommended literature	tba
Teaching methods	Lecture with exercises
Assessment method	Written examination, 60 min.
Language of instruction	English
Prerequisites	None

Statistics for Engineers

Course title	Statistics for Engineers
ECTS	5
Course type	Lecture/ practical exercises
SWS	4
Semester	Winter
Workload in hours	Total: 60 / In-class: 30 / Self-study: 30
Lecturer	Prof. Dr. Peter Ullrich
Course objectives	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.
Course contents	Descriptive Statistics, Probability Theory, Inductive Statistics, Programming with R.
Recommended literature	
Teaching methods	Lesson / practical work
Assessment method	Written examination, 90 min.
Language of instruction	English
Prerequisite	Elementary calculus

Water Management

Course title	Water Management
ECTS	2
Course type	Lecture and exercises, Presentation, Discussion
SWS	2
Semester	Winter semester
Workload in hours	Total: 60 / In-class: 24 / Self-study: 36
Lecturer	Prof. Dr. Wolfgang Rieger
Course objectives	At the end of the module, students will be able - to understand the dominating water related processes in the catchment scale, - to understand the concepts of integrated water resources management and flood risk management, - to understand the effects of climate change and anthropogenic interventions on hydrological processes and river basins, - to apply assessment and calculation approaches for water management in the catchment scale.

Course contents	- Hydrological processes, climate change and anthropogenic effects in the catchment scale
	- Integrated Water Resources Management (IWRM):
	  o Theory and History
	  o Blue-Green-Water-Concept
	  o Organization, System scales
	  o Implementation, recent and former examples
	- Flood Risk Management (FRM):
	  o Safety and Risk
	  o Cycle of Risk Management
	  o Content and meaning of EU-FloodRiskManagementDirective (FRMD)

	○ Types of flood protection measures - Calculation approaches: ○ Runoff generation processes in the catchment scale ○ Statistical methods to derive discharge parameters ○ Planning and designing flood protection measures
Recommended literature	The following documents / websites give an introduction to several topics of the module: - Water Resources System Planning and Management (Daniel P. Loucks, Eelco van Beek, 2017, ISBN978-3-319-44232-7) - Technical Background Papers on water resources management in various languages, written by the GWP Technical Committee (2000 – 2017, https://www.gwp.org/en/learn/KNOWLEDGE_RESOURCES/Global_Resources/background-papers/) - The EU Floods Directive - https://environment.ec.europa.eu/topics/water/floods_en - International Commission for the Protection of the Danube River (ICPD) - http://www.icpdr.org/main/ - Merz, B., J. Hall, M. Disse, and A. Schumann. "Fluvial Flood Risk Management in a Changing World." Natural Hazards and Earth System Science 10, no. 3 (March 16, 2010): 509–527. doi:10.5194/nhess-10-509-2010. - Bründl, M., Romang, H.E., Bischof, N., Rheinberger, C.M., 2009. The risk concept and its application in
Teaching methods	Lecture with presentations and exercises
Assessment method	Written examination, 60 min.
Language of instruction	English

Prerequisites	Mathematics

Selected Chapters of Control Engineering

Course title	Selected Chapters in Control Engineering
Course ID	CM-15/CM 2115 Master Electrical Engineering and Information Technology
ECTS	5 ECTS
Course type	Lecture/ practical exercises
SWS	4 SWS
Semester	Winter
Workload in hours	Time of attendance: 60 hours self-study: 90 hours Total: 150 hours
Lecturer	Prof. Dr. Müller
Course objectives	Students will be enabled to design suitable controllers and observers for challenging dynamic plants by means of the state-space method and implement it as a program. The students achieve the following learning objectives: **Professional Skills** • They can formulate dynamic systems in state-space • They name the most important properties and can calculate them • They can compute controllers and observers for low system order according to the pole-placement method • They can describe how observers work and what is their benefit • They can determine a discrete time description of a plant • They can implement a program for observer and controller

	• They know how to depict a system description within Matlab/Simulink
Course contents	1. Description of dynamic systems in state space a. Physical Modelling b. Set-up of State-Space Description from Other Models c. Methods for Solution of the Differential Equations 2. Properties a. Stability b. Controllability and Observability c. Canonical Forms 3. Design of Controllers a. Pole-Assignment Method for SISO Systems b. Pole-Assignment Method for MIMO Systems c. Other Design Methods 4. Design of Observers 5. Discrete-time description
Recommended literature	– R. Dorf / R. Bishop: Modern Control Systems. 13. edition. Pearson, 2017. – K. Ogata: Modern Control Engineering. 5. edition. Pearson, 2010. – N. Nise: Control Systems Engineering. 6. edition. Wiley, 2011. – S. Chapman: Matlab® Programming with Applications for Engineers. Cengage Learning, 2013.
Teaching methods	Blended Learning, tuition in seminars, exercises
Assessment method	Written examination, 90 min.
Language of instruction	English
Prerequisites	knowledge of the contents: - Mathematics: Linear algebra, Laplace transformation, z-Transformation, statistics - Control: Understanding of dynamic systems, description of dynamic systems in state space

Automotive Drive Systems

Course title	Automotive Drive Systems
Course ID	CM-17/ CM 2117 Master Electrical Engineering and Information Technology
ECTS	2
Course type	Lecture
SWS	2
Semester	Winter
Workload in hours	Total: 60
Lecturer	Prof. Dr. Müller
Course objectives	Advanced knowledge in control methods of speed variable drive systems Design of a sensorless field oriented control Characterize features of different accumulator technologies Knowledge about necessary infrastructure steps for electrical power supply of vehicles
Course contents	Power electronics control devices for electric machines Modeling of three phase AC machines Speed control of three phase AC machines (field oriented control) Storage devices for electrical energy Power supply for automotive applications

Recommended literature	Schröder D.: Elektrische Antriebe - Regelung von Antriebssystemen. Springer Verlag, 3. Auflage, 2009 Quang N. P., Dittrich J.-A,: Vector Control of Three-Phase AC Machines: System Development in the Practice. Springer-Verlag, 1. Auflage, 2008. H. Wallentowitz et. al.: Strategien zur Elektrifizierung des Antriebstranges. Vieweg+Teubner, 2009 Th. Becks et al.: Wegweiser Elektromobilität. VDE-Verlag, 2010
Teaching methods	Lecture, forms of media used: blackboard, transparencies
Assessment method	Written examination, 45 min.
Language of instruction	English
Prerequisites	Knowledge about basics of electric machines and power electronics
Miscellaneous	Students can choose if they want to take part in the second part of the course (Industrial Drive Systems) as well (only possible upon request!). There is the possibility to write a complete exam (90 min.) or just one part of the exam (45 min.)

Advanced Circuits Lab

Course title	Advanced Circuits Lab
ECTS	5
Course type	Practical Exercises
SWS	4
Semester	Winter and summer
Workload in hours	Total: 150 / In-class: 60 / Self-study: 90
Lecturer	Michael Benisch
Course objectives	In the subject Advanced Circuits Lab students obtain an insight into analogue electronic circuits. The students achieve the following learning objectives: **Professional Skills:** The students know and understand the functionality of different typical analogue electronics circuits. They understand the importance of the bias point and are able to dimension the bias point for various circuits. They can dimension and analyze the small signal behavior of semiconductor circuits as well as the transient behavior. They have the ability to analyze and apply analogue semiconductor circuits for AF and RF. The students know oscillator circuits and dimension and analyze them.The students have the ability to design analogue semiconductor circuits. **Methodological Skills:** The students are able to dimension and optimize electronic analogue circuits with the help of theoretical considerations and simulation. The students are able to differentiate between various circuits and can assess the

	advantages and disadvantages of different amplifiers and oscillators. The students have the ability to independently research and develop existing basic knowledge. Students can evaluate the properties of electronic circuits by measurements. **Soft Skills:** Students are able to reasonably justify and critically evaluate the basic properties of analogue electronic circuits. In lab teams the students learn to substantiate their simulation and measurement results. The students are able to present and explain their measurement results and theoretical findings in a convincing, informative and comprehensible way.
Course contents	• **Lessons for introduction of specific topics** - Applications of analogue circuits - Diodes and Transistors - Amplifiers - RF circuits (Oscillators, PLL) • **Lab Experiments** - optional: Introduction to circuit simulation - optional: Introduction to basic electronics measurement equipment - Diode circuits: voltage doubler (Villard and Greinacher circuit), voltage cascade, diode as switch - integrated circuits: Timer circuit NE555 - Design of AF-amplifier according to specification - Differential amplifier: Characteristics, current source, application - Operational Amplifier - Quasi-linear AF-power-amplifier: Class A, B, AB operation, biasing, output power, efficiency - Phase locked loop ? PLL - RF-Oscillators: Phase-shift oscillator, Wien-bridge oscillator, Colpitts-oscillator, LC-oscillators, Franklin-oscillator - optional: RF-measurements: S-Parameter and time domain reflectometry

Recommended literature	Tietze / Schenk: Electronic Circuits: Handbook for Design and Application, 2nd edition, Springer Verlag, 2008. Streetman / Banerjee: Solid State Electronic Devices, 6th edition. Prentice Hall, 2006. Comer / Comer: Fundamentals of electronic circuit design. Wiley, 2002. Comer / Comer: Advanced electronic circuits design. Wiley, 2003. Scherz / Monk: Practical electronics for inventors. McGraw Hill, 2016. Horowitz / Hill: The art of electronics. 3rd edition. Cambridge University Press, 2015.
Teaching methods	Practical work and lesson style lectures for introduction of specific topics
Assessment method	Project and written examination (90 min.)
Language of instruction	English
Prerequisites	Formally: Admission test Lab seats will be assigned based on the test. Content of the test: General basics of electrical engineering, basics of semiconductor devices, and basics of electronic networks. In terms of content: Fundamentals of electrical engineering, basic knowledge of solid state devices (bipolar junction transistors, diodes), basics of electronic networks

Industrial Computed Tomography

Course title	Industrial Computed Tomography
ECTS	5
Course type	Lecture
SWS	4
Semester	Winter and summer
Workload in hours	Total: 150 / In-class: 60 / Self-study: 90
Lecturer	Dr. Gabriel Herl
Course objectives	The course deals with industrial computed tomography (CT). In the subject "Industrial Computed Tomography", students learn how computed tomography works (starting with the generation of X-rays up to the 3D reconstruction of CT volumes), 2D and 3D image processing methods on CT data sets as well as concrete industrial applications of CT in practice. **The students achieve the following learning objectives:** The students will learn the structure and mode of operation of CT systems for the digitization of any objects, especially for industrial quality inspection: • How does CT work? • What can CT do? • How is CT used? • How is CT data processed and analyzed for industrial applications? • Insight into industrial quality inspection and metrology. Students will understand how CT systems work and, in particular, will be able to

	• assess whether an object can be digitized with given CT systems • perform a simple CT scan themselves • assess the data quality and reliability of a CT scan • explain and perform rudimentary data and image processing operations on CT data.
Course contents	**Lecture:** - Fundamentals of 2D X-ray technology - Basis of X-ray physics - Structure of CT systems - Fundamentals of signal and image processing - Fundamentals of 3D X-ray computed tomography - From 2D proj. to 3D volumes - CT reconstruction - CT imaging fidelity and correction methods - Construction of application-specific special CT systems - Image processing on CT data, esp. industrial metrology - Applications of CT data (mainly industrial, but also elsewhere, e.g., in security and medicine) - Comparison to other sensor technologies (e.g. ultrasound or thermography) **Practical part:** - Radiation protection instruction - Execution of an own CT scan - Evaluation of CT data for industrial application
Recommended Literature	Buzug, Thorsten M. Einführung in die Computertomographie: mathematisch-physikalische Grundlagen der Bildrekonstruktion. Springer-Verlag, 2011. Kalender, Willi A. Computertomographie: Grundlagen, Gerätetechnologie, Bildqualität, Anwendungen. Publicis Corporate Publ., 2006. Maier, Andreas, et al., eds. "Medical imaging systems: An introductory guide.", 2018. Carmignato, Simone, Wim Dewulf, and Richard Leach, eds. Industrial X-ray computed tomography. Cham: Springer International Publishing, 2018.

Teaching methods	Lecture, practical experiments in the CT laboratory as well as own study work with presentation in the seminar.
Assessment method	Seminar paper on a research-related, practice-relevant topic including own presentation.
Language of instruction	English
Prerequisites	None

Optical Metrology and Optical Sensors

Course title	Optical Metrology and Optical Sensors
ECTS	5
Course type	Lecture
SWS	4
Semester	Winter
Workload in hours	Total: 150 / In-class: 60 / Self-study: 90
Lecturer	Prof. Dr. Jens Ebbecke
Course objectives	This course will give the students an overview of the application driven field of optical metrology with optical sensors. After completing the subject, the students have achieved the following learning objectives: They are able to explain the specialities of the optical sensors used for distinct optical metrology fields. The students are able to choose a certain optical sensor for a specified optical problem. The students will learn to differentiate between the different optical metrology tasks. Students are capable to solve complex problems in the field of optical metrology.
Course contents	1. Optical basics and components 2. 3D shape detection 3. Temperature examination techniques 4. Measurements of fluid flows 5. Optical detection of mechanical vibrations and motion studies 6. Surface analysis 7. Optical determination of mechanical strain 8. Distance and velocity detection 9. Deformation measurement

	10. Damage detection 11. Special applications of optical metrology
Recommended literature	S. Donati: Electro-Optical Instrumentation: Sensing and Measuring with Lasers;Prentice Hall K. J. Gåsvik: Optical Metrology; Wiley M. Schuth + W. Buerakov: Handbuch Optische Messtechnik; Hanser Verlag G. Booker: Sensors for Ranging and Imaging; Scitech Publishing
Teaching methods	Lecture, seminar-like instructions, exercises
Assessment method	Written examination, 90 min.
Language of instruction	English
Prerequisites	None

Introduction to the Finite Element Method

Course title	Introduction to the Finite Element Method with NASTRAN & PATRAN
ECTS	4
Course type	Lectures with workshops
SWS	4
Semester	Winter and summer
Workload in hours	Total: 120 / in-class: 40 / Self-study: 80
Lecturer	Prof. Dr. Christian Bongmba
Course objectives	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.
Course contents	1. Introduction – What is the Finite Element Method? 2. Discretization examples 3. Development of truss element 4. Development of beam element 5. Two-dimensional elements 6. Three-dimensional elements 7. Workshops with MSC NASTRAN und PATRAN linear static, normal modes and buckling
Recommended literature	Logan, Daryl L.: A First Course in the finite Element Method, CENGAGE Learning 2012.

Teaching methods	Lectures, workshops and videos
Assessment method	Workshops and term paper
Language of instruction	English
Prerequisites	Statics, Strength of Materials

Introduction to Solidworks (CAD)

Course title	Introduction to Solidworks (CAD)
ECTS	3
Course type	Lecture with CAD exercises
SWS	2
Semester	Winter and summer
Workload in hours	Total: 90 / In-class: 30 / Self-study: 60
Lecturer	Prof. Dr.-Ing. Karl Hain
Course Objectives	Students are able to apply Solidworks CAD system for product development
Course Contents	• Overview and menus • Sketch elements, tolerance, dimensioning • Modeling single parts • Modeling assemblies • Modeling welded parts • Simulations
Teaching Methods	Supervised CAD exercises at PCs
Assessment Method	Written examination, 90 min.
Language of Instruction	English
Prerequisites	Basics of design and product development

Advanced Solidworks (CAD)

Course title	Advanced Solidworks (CAD)
ECTS	3
Course type	Practical exercises with CAD system Solidworks
SWS	2
Semester	Winter and summer
Workload in hours	Total: 90 / In-class: 30 / Self-study: 60
Lecturer	Prof. Dr.-Ing. Karl Hain
Course objectives	Students are able to apply Solidworks CAD system for more complex product development
Course contents	• Loft boss/base techniques • Spline functions • Surface modelling tools and techniques • Sheet metal parts • Advanced mechanical mates for assemblies
Recommended literature	Solidworks online help
Teaching methods	CAD exercises / practical work
Assessment method	Written examination, 90 min.
Language of instruction	English
Prerequisites	Basic knowledge of design and product development

MATLAB in Engineering Applications

Course title	MATLAB in Engineering Applications
ECTS	2
Course type	Lecture with computer exercises (computer lab)
SWS	2
Semester	Winter
Workload in hours	Total: 60 / In-class: 24 / Self-study: 36
Lecturer	Prof. Dr. Mathias Hartmann
Course objectives	Students are able to handle the MATLAB Desktop and are aware what MATLAB can do or can't do. They are prepared to solve simple and advanced numerical problems in MATLAB and can transfer these capabilities to basic engineering applications. To solve more sophisticated problems, participants of the course are up to formulate programs in the MATLAB m-file language.
Course contents	1. An Overview of MATLAB ® 2. Numeric, Cell, and Structure Arrays 3. Functions and Files 4. Programming with MATLAB 5. Advanced Plotting 6. Model Building and Regression 7. Statistics, Probability, and Interpolation 8. Linear Algebraic Equations 9. Numerical Methods for Calculus and Differential Equations 10. Simulink 11. Symbolic Math: MuPAD
Recommended literature	Palm, W. J.: Introduction to MATLAB for Engineers
Teaching methods	Lecture with integrated MATLAB exercises

Assessment method	Written examination, 60 min.
Language of instruction	English
Prerequisites	Calculus, basic computer knowledge

Introduction to Quality Management

Course title	Introduction to Quality Management
ECTS	4
Course type	Lecture
SWS	2,5
Semester	Winter and summer
Workload in hours	Total: 60 / In-class: 30 / Self-study: 30
Lecturer	Prof. Dr. Christian Wilisch
Course objectives	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.
Course contents	• What is 'quality'? • Historical context of quality management • Financial aspects of quality management • Quality techniques and their applications • Process control techniques
Recommended literature	• Imai, Masaaki: Gemba Kaizen, 2nd ed., McGraw-Hill, New York, 2012 • Chalkiadakis, Ioannis: New Product Development with the Use of Quality Function Deployment, Lambert, Mauritius, 2019 • Montgomery, Douglas C.: Introduction to Statistical Quality Control, Wiley, New York, 2019
Teaching methods	Lectures with discussions and presentations
Assessment method	Written paper to be presented in class

Language of instruction	English
Prerequisites	None

Projects in Science and Engineering

Course title	Projects in Science and Engineering
ECTS	6
Course type	Project
SWS	4
Semester	Winter and summer
Workload in hours	180
Lecturer	Prof. Dr. Thomas Stirner
Course objectives	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
Course content	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
Recommended literature	Specific to the project
Teaching methods	Supervision
Assessment method	Written report and oral presentation

Language of Instruction	English
Prerequisites	None

Advanced Projects in Science and Engineering

Course title	Advanced Projects in Science and Engineering
ECTS	6
Course type	Project
SWS	4
Semester	Winter and summer
Workload in hours	180
Lecturer	Prof. Dr. Thomas Stirner
Course objectives	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
Course content	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
Recommended literature	Specific to the project
Teaching methods	Supervision

Assessment method	Written report and oral presentation
Language of Instruction	English
Prerequisites	Projects in Science and Engineering

Projects in Industrial Engineering

Course title	Projects in Industrial Engineering
ECTS	6
Course type	Project
SWS	4
Semester	Winter and summer
Workload in hours	180
Lecturer	Prof. Dr. Jutta Stirner
Course objectives	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.
Course content	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.
Recommended literature	Specific to the project
Teaching methods	Supervision
Assessment method	Written report

Language of instruction	English
Prerequisites	None
Miscellaneous	Max. 10 participants

Advanced Projects in Industrial Engineering

Course title	Advanced Projects in Industrial Engineering
ECTS	6
Course type	Project
SWS	4
Semester	Winter and summer
Workload in hours	180
Name of lecturer	Prof. Dr. Jutta Stirner
Course objectives	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
Course content	Advanced projects or part of an advanced project may be of a theoretical nature (e.g. literature review, data mining, etc.) or of a statistical nature (e.g. data analysis 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.
Recommended literature	Specific to the project: Google Scholar, Science Direct via THD library
Teaching methods	Supervision
Assessment method	Written report

Language of Instruction	English
Prerequisites	Projects in Industrial Engineering

International Business Development

Course title	International Business Development
Course ID	A3111
ECTS	5
SWS	4
Semester	Winter
Workload in hours	Total: 150 / In-class: 60 hrs / Self-study: 90 hrs
Lecturer	Mr. Jack Romero
Course objectives	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.
Course contents	Perspectives on Strategy: • Strategic thinking from both an internal and external perspective. • Foundations of strategy and strategic perspectives • Strategies for innovation, product, process, organization, marketing Entrepreneurship and Business Growth • Maintaining entrepreneurial drive • Government partnering • Turnaround strategies Managing Networks and Internationalisation • How to develop business capabilities through internationalization and networking • Building, maintaining and supporting businesses with various modes of foreign operations

	• Meeting competition from existing incumbents as well as new entrants • Balancing cooperation and competition Strategizing in Business Development • Participation in a real-life strategic process • Acting based on assembled knowledge • Developing a business idea
Teaching methods	• Lectures • Group work • Case studies • Learning based on experiences • Exercises
Recommended literature	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
Assessment method	written paper
Language of instruction	English

IT Skills for Project Managers

Course title	IT Skills for Project Managers
ECTS	5
Course type	Lecture
SWS	4
Semester	Winter
Workload in hours	Total: 150 / In-class: 60 / Self-study: 90
Lecturer	Reijo Koivula
Course objectives	This course is suitable not only for students who are planning to specialize in project management, but also for students who plan to become operating, product, marketing and general managers.
Course contents	The emphasis is not on becoming an IT specialist but rather on how to use information systems and software applications in the context of efficiently managing projects.
Teaching methods	In-class lectures and virtual sessions
Assessment method	Written paper
Language of instruction	English
Prerequisites	None

Principles of Management and Scientific Writing

Course title	Principles of Management and Scientific Writing
ECTS	5
Course type	Lecture
SWS	4
Semester	Winter
Workload in hours	Total: 150 / In-class: 60 / Self-study: 90
Lecturer	Prof. Dr. Adrian Hubel / Susanne Reimann
Course objectives	Students should become aware of the various aspects, components, and functions of management and discover why the subject of international management is both attractive and demanding. A variety of aspects relevant in regard to management is broadly to make students aware of the breadth of possible career choices available to them before they choose to specialize. Students learn to analyze and understand current issues and developments in international business contexts and develop an understanding for business ethics. The purpose of the part "Scientific Writing" is to teach and model how to write scientific papers and bachelor thesis. Students should learn how getting started with the research topic, the necessary components (introduction, results, discussion) of a scientific paper. The course deals with the question what is plagiarism, how to avoid it and how does correct paraphrasing and citing work. Furthermore, students will get an introduction in literature research.
Course contents	**Principles of Management** The course shows students how and why businesses operate the way they do by covering essential introductory business topics. Students are presented with a broad picture of the various aspects and functions of business that together make for a successful enterprise and are

	introduced to the concept of strategic planning as it relates to business organisations. Topics introduced include business planning, organisation, the business environment, management, marketing, finance, production, human resource management, and business ethics. Outline: 1. The Concept of Management 2. The Evolution of Management 3. Management in a Changing Environment 4. Business Ethics and Corporate Social Responsibility 5. Management Practice 6. Case Studies **Scientific Writing** The course covers mainly the following items: 1. Selecting a Research Topic 2. Using the Literature to Research the Problem 3. Conducting Ethical Research 4. Structure and Style of the Paper: Introduction, Methods, Results, Discussion 5. Formatting, Reference List, Tables, Figures, Appendixes
Recommended literature	Kreitner, R. (2009), Principles of Management. South-Western Cengage Learning Lussier, R.N. (2014) Management Fundamentals: Concepts, Applications, & Skill Development, SAGE McCormack, M.H. (1994) What they don't teach you at Harvard Business School, Profile Books Kinicki, A. / William B.K. (2009) Management, McGraw-Hill Koontz, H. / Weihrich, H. (1996), Essentials of Management (5th ed). McGraw-Hill Jones, G. / George, J., (2011) Essentials of Contemporary Management (4th ed). McGraw-Hill Russey, W. / Ebel H./ Bliefert C. (2006) How to Write a Successful Science Thesis
Teaching methods	The course makes extensive use of short international oriented case studies to illustrate the practical problems facing businesses. The students are asked to assume the role of entrepreneur for evaluating how various principles of management should be applied. Students are placed in small teams to analyse and prepare particular cases for presentation. Their overriding task is determining how certain basic management principles can be applied to practice. Team presentations are followed up with instructor feedback and a lively discussion revolving around a list of written analytical questions prepared by students not making the presentations. The instructor's

	role is to assure that key concepts are correctly interpreted, summarised and stressed.
Assessment method	oral examination, assignment (written paper)
Language of instruction	English
Prerequisites	None