Course Descriptions International Computer Science

Winter Semester 2024/25

4 July 2024

German (different course levels)

Course title	see schedule Language Centre
ECTS	4
Course type	Seminar
SWS	4
Semester	Winter and Summer
Workload in hours	60 hrs
Assessment method	Written examination, 90 min.
Language of instruction	German

Please find here the course descriptions for German language courses at all course 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
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. The exam will be based on topics covered during the semester.
	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.
Recommended Literature	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
Teaching methods	• Lectures • Group work • Case studies • Presentation • Exercises
Assessment method	Class workshops / presentation / case studies / seminar paper
Language of instruction	English
Prerequisites	None

Scientific Communication

Course title	Scientific Communication
ECTS	2
Course type	Elective
SWS	2
Semester	Summer
Workload in hours	Total: 60 / In-class: 30 / Self-study: 30
Lecturer	Prof. Dr. Jeff Wilkesmann
Course objectives	Knowledge: • learn to manage a range of resources and skills for effective communication of complex scientific material • learn how to appropriately summarize, paraphrase and reference research content and avoid plagiarism • Scientific communication types and techniques • Presentation Techniques Skills: • learn to cultivate practical communication skills, with particular emphasis on effective writing Competencies: • undertake a substantial practical project in science writing • prepare a poster and perform a scientific pitch
Course contents	• Systematic literature review: Definition of research question/eligibility criteria. Development of search strategy. Title/abstract/full text screening. Data extraction/quality assessment. Synthesis of results/meta-analysis

- Scientific Communication: The Different Scientific Communication Ways. Scientific writing. Avoiding plagiarism, fabrication and falsification. The good style of writing. Paraphrasing, Summarizing, Referencing. Good and bad practice examples. Scientific Style Conventions. Graphics & Multimedia. Tables. References. Editorial Style Conventions. Effective Writing & Word Usage. Grammar, Punctuation, & Spelling. General Style Conventions. Numbers, Mathematics, & Units of Measure. Inclusivity Style. General Guidelines. Age. Disabilities, Disorders, & Other Health Conditions. Gender & Sexuality. Race, Ethnicity, & Nationality.
- Ethics in Scientific Publication. Communicating Safety Information. Intellectual Property: Copyright, Permissions. Scientific misconduct. Forms of scientific misconduct (fabrication, falsification, plagiarism, …). Motivation to commit scientific misconduct. Responsibility (author, institutions, journals)
- Science and Engineering publishing. Journal landscape and selection. Publication impact assessment (Impact factors, H-index). Authorship. Submission/review process. Writing about Your Research: Best Practices. Selecting a Scientific Journal. Organization of Your Research Article. Submission Procedures. Peer Review.
- Scientific communication pitching. Preparation of an oral presentation and pitching session.

Recommended literature	**Textbook:** Introduction - The ACS Guide to Scholarly Communication (ACS Publications) https://pubs.acs.org/page/acsguide eISBN: 978-0-8412-3583-0 DOI: 10.1021/acsguide **Recommended literature:** • annex-9-inclusive-communication-guidelines-of-the-european-parliament.pdf (europa.eu) • Inclusive communication in the GSC - Publications Office
Teaching methods	Seminars constructed like workshops in combination with teamwork and team presentation.
Assessment method	Written assignment & presentation incl. Q+A Session
Language of instruction	English

Databases

Course title	Databases
ECTS	5
SWS	4
Course type	Lecture
Semester	Winter and summer
Workload in hours	In-class: 60 hrs. / Self-study: 90 hrs / Total: 150 hrs
Lecturer	Prof. Dr. Michael Scholz
Course objectives	After this module students should • be able to describe the database design process, • know the elements of the Entity-Relationship-Model, • can build an Entity Relationship Model for a specific case, • can normalize a database design, • be able to manage a database through a database management system, • be able to query a database using SQL, • know the core components and functionalities of a database management system.
Recommended literature	Conolly, Thomas M.; Begg, Carolyn E.: Database Solutions - A step-by-step guide to building databases. 2nd Edition. Harlow, Essex: Pearson Education Limited, 2004 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

Teaching methods	Classes with exercises and practical training Course and document management through E-Learning System iLearn
Assessment method	Written examination, 90 min.
Language of Instruction	English
Prerequisites	Basics in Computer Science

Informatics I

Course title	Informatics I - Intro to Unix and Python
ECTS	5
SWS	4
Semester	Winter
Workload in hours	Total: 150 In-class: 60 / Self-study: 45 / virtual learning: 45
Lecturer	n.n.
Course objectives	After successful accomplishment, the students can: **Professional competences** – summarize the challenges of biomedical text analysis – list various scientific text resources and differentiate them – outline the motivation behind ontologies for knowledge representation **Methodological competences** – implement shell scripts for automating information retrieval, text processing, and semantics processing – breakdown given shell scripts into various components, tweak it for further purposes, and localize errors – apply XPath expressions to extract data from XML files – evaluate a shell script regarding performance considerations and suggest improvements – apply regular expressions on text to extract relevant information

	– find correlations between concepts (e.g., does caffeine lead to malignant hyperthermia?) – implement Python programs which can solve simple text processing and automation problems **Social competences** – give constructive feedback to peers in context of peer-assessed exercise

Course contents	– data and text processing using the shell
	  – biomedical text resources
	  – semantics
	  – data retrieval
	  – data extraction
	  – task repetition
	  – XML processing
	  – text retrieval
	  – text processing
	  – pattern matching
	  – regular expressions
	  – tokens & entities & relations
	  – semantics processing
	  – classes
	  – entity linking
	  – performance considerations
	– programming with Python
	  – control structures
	  – data structures
	  – objects & algorithms

Recommended literature	– Couto, Data and Text Processing for Health and Life Sciences – Joyner, Introduction to Computing, 2016, ISBN: 1-260-08227-X
Teaching methods	Seminar-like classes, interactive exercises during lecture
Assessment method	Written examination, 90 min.
Language of instruction	English
Prerequisites	Introduction to Informatics

Innovation Management for Artificial Intelligence

Course title	Innovation Management for Artificial Intelligence
ECTS	3
Course type	Lecture and seminar
SWS	2
Semester	Winter
Workload in hours	90 hours
Lecturer	Prof. Dr. Patrick Glauner
Course objectives	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 course has been offered since 2020 and was at that time the first one world-wide to 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.
Course contents	• Introduction: how AI is changing our society, selected examples of successful and unsuccessful AI projects and transformations • History and promises of AI: Dartmouth conference, AI from 1955 to 2011, AI winters • Deep learning era: breakthroughs, DeepMind, promises and hypes, no free lunch theorem, AI innovation in China, technological singularity

	• Contemporary challenges: prophets of AI doom, regulation, assurance, explainable AI, ethics, patents, copyright • AI transformation of companies: opportunities, challenges, best practices, roles, data strategy, data governance • Case studies on how to turn companies into AI-driven companies
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.
Teaching methods	Lecture and seminar
Assessment method	Seminar presentation
Language of instruction	English
Prerequisite	Foundations of AI

Quantum Computing

Course title	Quantum Computing
ECTS	5
Course type	Lecture and seminar
SWS	4
Semester	Winter
Workload in hours	150 hours
Lecturer	Prof. Dr. Patrick Glauner, Prof. Dr. Horst Kunhardt
Course objectives	This class provides students with an introduction to Quantum Computing (QC), which looks promising to solve certain computational problems substantially faster than classical computers. QC began in the early 1980s and in recent years, investment into QC research has increased in both the public and private sectors. Students will acquire knowledge in QC and its applications in various domains such as machine learning and cryptography. They will also be able to elaborate it further in the future, for example in projects or further studies. Overall, QC is a cutting-edge field, with many high-pay opportunities for graduates.
Course contents	• Introduction: history, comparison to traditional computing, applications, business potentials • Foundations: complex numbers, complex vector spaces • Systems: deterministic systems, probabilistic systems, quantum systems, assembling systems • Quantum theory: states, superposition, observables, measuring, dynamics, assembling quantum systems, entanglement • Architecture: bits and qubits, classical gates, reversible gates, quantum gates, no-cloning theorem, mixed states

	• Selected algorithms: Deutsch's, Deutsch-Jozsa, Simon's, Grover's, Shor's • Theoretical computer science: limits of quantum computing, complexity classes • Quantum computers and programming: goals and challenges, decoherence, physical realizations, quantum annealing, adiabatic quantum computing • Applications: quantum machine learning, quantum cryptography, quantum information theory
Recommended literature	1. S. Aaronson, "**Quantum Computing since Democritus**", Cambridge University Press, 2013. 2. P. Glauner and P. Plugmann (Eds.), "**Innovative Technologies for Market Leadership: Investing in the Future**", Springer, 2020. 3. N. S. Yanofsky and M. A. Manucci, "**Quantum Computing for Computer Scientists**", Cambridge University Press, 2008.
Teaching methods	Lecture and seminar
Assessment method	Seminar presentation
Language of instruction	English
Prerequisite	Linear algebra and complex numbers

Mobile and Wireless Networks

Course title	Mobile and Wireless Networks
ECTS	5
Course type	Lectures with exercise sessions, where students demonstrate how they solve problems related to class topics.
SWS	4
Semester	Winter
Workload in hours	Total: 150 / In-class: 60 / Self-study: 90
Lecturer	Prof. Dr. Andreas Kassler
Course objectives	Upon completion of the course, students should be able to: - explain the principles and limitations of wireless communication, - explain important technical aspects of current wireless communication systems, - compare and contrast different wireless communication systems based on an understanding of shared challenges (such as mobility management), - explain the principles of medium access control and why they have been designed in a certain way, - summarise key functions and principles behind different architectures for mobile and wireless communication systems, - critically evaluate different properties of a mobile communication system, taking into account design considerations, capacity, and limitations in relation to the technology in question.

Course contents	The course treats the principles of mobile and wireless, including the function and operation of modern mobile and wireless communication systems and networks related to architecture, protocol, and algorithms. Current wireless systems, such as cellular systems and mobile Internet, including the WLAN standard IEEE 802.11, are used as examples to explain these principles. The course includes components and exercises that treat these topics in-depth. The course covers the following: - Radio signals - Coding, modulation, and multiplexing - Medium access - The basic principles of cellular systems and networks - WLAN (e.g. WiFi) and WPAN (e.g. Bluetooth)
Recommended literature	Schiller, Jochen (2003). Mobile Communications (2nd edition). Addison Wesley Stallings, William and Beard, Cory (2016). Wireless Communications Networks and Systems
Teaching methods	- Interactive Lectures - Interactive Exercise Sessions - In addition for Master students: They need to read a scientific paper of their choice that suits the course content, present the paper in a workshop and lead a discussion around it
Assessment method	Course portfolio
Language of instruction	English
Prerequisites	Students should have basic understanding of computer networks.

Advanced Automation

Course title	Advanced Automation
ECTS	5
SWS	4
Semester	Winter
Workload in hours	Total: 150 / In-class: 60 / Self-study: 90
Lecturer	Prof. Dr. Terezia Toth
Course objectives	In the subject Advanced Automation, students obtain an overview on how programmable logic controllers (PLCs) work, as well as basic hardware and software requirements. They learn the standardized (IEC61131-3) and manufacturer-specific (TIA Portal) programming options. They learn how to use visualization software for the user interface. The students acquire the basic competence to understand automated processes in the automotive industry, power plants, chemical industry, building technology and transportation. Thus, the students are able to shape the digital transformation of the industry. **Professional Skills** The students are familiar with the concepts and components of a modern automation system including the structure and functionality of industrial communication systems, also with regard to safety and security.

	They are able to analyse, classify and solve simple tasks in automation technology. The students know the requirements of hardware and software for a Programmable Logic Controller (PLC). They know the structure and the way a PLC operates. They are able create PLC programs. By using visualization software, they can demonstrate the processes. **Methodological Skills** The application-oriented knowledge allows the students to compare advantages and disadvantages of the individual industrial bus systems, to examine in contrast the advantages and disadvantages of the individual programming languages to find optimal solutions. **Soft Skills** The students work on problems in a focused and independent way. They can communicate their solutions both verbally and in writing in appropriate technical language. They learn from mistakes, can assess and improve their own abilities. They are able to work actively as a team.
Course contents	1. Function of SPS 1.1. Hardware requirements 1.2. Current embodiments 1.3. Environmental conditions 1.4. Real-time requirements

	2. Programming languages 3. Presentation of automation technology with regard to industrial communication 3.1. ISO / OSI model in industrial communication 3.2. Automation pyramid 3.3. Vertical communication 3.4. Structure and functionality of common communication systems
Recommended literature	-R. Laubner / P. Göhner: Prozessautomatisierung I. Springer Verlag 1999. -G. Wellenreuther / D. Zastrow: Steuerungstechnik mit SPS, Springer/Vieweg 2015. -G. Wellenreuther: Automatisieren mit SPS - Übersichten und Übungsaufgaben, Springer/Vieweg 2015. -K. John / M. Tiegelkamp: SPS-Programmierung mit IEC, Springer Verlag 2009. -G. Schnell: Bussysteme in der Automatisierungstechnik, 4. Auflage. Vieweg Verlag 2000. -W. Kriesel / O. Madelung: AS-Interface – Das Aktuator-Sensor-Interface für die Automation. Hanser Verlag 1999. -M. Popp: Profibus-DP/DPV1, 2. Auflage. Hüthig Verlag 2000. -M. Popp: Das PROFINET IO-Buch: Grundlagen und Tipps für Anwender, 2. Auflage. VDE Verlag 2010. -Ausbildungsunterlagen der Fa. Siemens: www.siemens.com/global/de/home/unternehmen/nachhaltigkeit/ausbildung/sce.html
Teaching methods	Seminars with practical experience Work studies in the lab
Assessment method	Written examination, 90 min.
Language of	

instruction	English
Prerequisites	None