Catalogue of courses offered in English - WiSe 2023/24

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Dear exchange students,

This catalogue contains the descriptions of the elective courses conducted in English at Nuremberg Tech in winter semester 2023/24. The courses included in this catalogue are open for all exchange students regardless of the degree programme you are enrolled in at our university. You can participate in any course you are interested in as long as you meet the prerequisites.

Attending these courses can develop not only your academic knowledge, but as they are interdisciplinary and many of them are open to all types of students, you will gain experience in a truly diverse environment.

We hope you find some interesting options for this semester in Nuremberg in addition to the courses from our Language Center and the regular courses in your degree programme. Have a look - it's worth your while! If you have any questions about the courses you can take, please contact the coordinator of this catalogue, Rebecca Ehrig, at rebecca.ehrig@th-nuernberg.de

Last updated on: 21 September 2023

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Area Studies - Doing Business in China (3 ECTS)

Course name	**Area Studies - Doing Business in China (3 ECTS)**
Learning objectives	In the past few decades China has developed into one of the most powerful national economies in the world and has thus expanded its social and political influence not only in Asia, but also worldwide. For Europe, China is one of the most important cooperation partners in many areas, but at the same time it is also a serious competitor and rival in other areas. Knowing and understanding China is therefore becoming a crucial competence for all responsible actors in our society. This course will equip students with foundational knowledge about the history and culture as well as the recent political and economic development in China. One of the focus areas will be the changing role of China in the world economy during the globalization/deglobalization process. Another focus area is to gain insight into different business and inter-cultural aspects when doing business in and with China. Group discussions will help the students apply their new knowledge in order to efficiently develop their competence. After successful participation in this course students will: - know the historical background and the current political and economic system of the country - understand the international positioning of the country in a globalized business environment - be able to assess country-specific opportunities and risks for international and local companies when doing business in and with the country - be able to demonstrate how regional culture impacts business and management practice - be able to work or conduct business with local people both in the country/region and internationally - be able to correctly apply subject-specific English terminology/vocabulary
Content	- Introduction and historical background of the country - The current political system and recent societal development - National/regional economy and its international positioning - Economic relationship between the region and EU / Germany - How international companies operate in (e.g.) China - Strategic positioning and uniqueness of local companies - Regional culture and its influences on companies' strategic - management frameworks and intercultural communication - Geographical scheme of the regional/country/area
Other requirements/information	Basic knowledge of business administration is required.

	There is a 3 ECTS and a 5 ECTS version of this course. Students can only take one of them.
Course format	Seminar-style lecture
Credits (ECTS)	3
Lecture hours (LVS)	4
Type of assessment	Written examination (90 minutes)

Area Studies - Doing Business in China (5 ECTS)

Course name	**Area Studies - Doing Business in China (5 ECTS)**
Learning objectives	In the past few decades China has developed into one of the most powerful national economies in the world and has thus expanded its social and political influence not only in Asia, but also worldwide. For Europe, China is one of the most important cooperation partners in many areas, but at the same time it is also a serious competitor and rival in other areas. Knowing and understanding China is therefore becoming a crucial competence for all responsible actors in our society. This course will equip students with foundational knowledge about the history and culture as well as the recent political and economic development in China. One of the focus areas will be the changing role of China in the world economy during the globalization/deglobalization process. Another focus area is to gain insight into different business and inter-cultural aspects when doing business in and with China. Group discussions will help the students apply their new knowledge in order to efficiently develop their competence. After successful participation in this course students will: - know the historical background and the current political and economic system of the country - understand the international positioning of the country in a globalized business environment - be able to assess country-specific opportunities and risks for international and local companies when doing business in and with the country - be able to demonstrate how regional culture impacts business and management practice - be able to work or conduct business with local people both in the country/region and internationally - be able to correctly apply subject-specific English terminology/vocabulary
Content	- Introduction and historical background of the country - The current political system and recent societal development - National/regional economy and its international positioning - Economic relationship between the region and EU / Germany

	- How international companies operate in (e.g.) China - Strategic positioning and uniqueness of local companies - Regional culture and its influences on companies' strategic - management frameworks and intercultural communication - Geographical scheme of the regional/country/area
Other requirements/information	Basic knowledge of business administration is required. There is a 3 ECTS and a 5 ECTS version of this course. Students can only take one of them.
Course format	Seminar-style lecture
Credits (ECTS)	5
Lecture hours (LVS)	4
Type of assessment	Written examination (90 minutes); case study presentation

Chemistry and the Energy Transition

Course name	**Chemistry and the Energy Transition**
Learning objectives	Students will be introduced to modern methods of electrical and chemical energy generation, conversion, and storage. In the course, the current methods for energy generation, energy conversion, and energy storage are to be presented as practically as possible. These are exclusively sustainable processes and methods from the fields of electrochemistry, process engineering, electrical engineering, and biochemistry. The energy transition that was started can only be successfully continued and completed if the various methods of energy generation, storage, and conversion are optimally coupled and interlinked. Therefore, one of the main goals of the course is to understand the interconnection of the different topics. One way to achieve this goal is the detailed, comparative study of the different methods of energy generation, energy conversion, and energy storage as presented in the current script.
Content	Based on the learning objectives, the contents of the course are as follows: - Gasoline vs. diesel engine: avoidance of harmful exhaust gases - detoxification of harmful exhaust gases, detailed description of the effect of AdBlue - Hydrogen economy - production of green hydrogen, hydrogen as means of energy storage, hydrogen fuel cell (PEMFC) as energy converter and propulsion in vehicles - Methanol economy - synthesis of green methanol, direct methanol fuel cell (DMFC) as drive medium in vehicles, detailed comparison of PEMFC and DMFC - Methane economy - production of green methane: details of the mechanism of anaerobic digestion of agricultural residues in biogas plants - Electrochemical conversions as basis of electromobility - details on the conversions "electrical to chemical" (electrolytic cell) and

	"chemical to electrical" energy (galvanic cell) in primary and secondary batteries, lithium-ion-cells as the basis of electromobility - Renewable resources - first- and second-generation biofuels, sustainable biodiesel, bioethanol, e-fuels as a group of XtL fuels - Use of solar energy: solar thermal and photovoltaic - presentation of the most important methods of solar thermal and coupling with other heating systems - Photovoltaic: functioning of silicon solar cells in the framework of the photoelectric effect - Use of wind energy for electricity generation - physics of wind energy and efficiency of wind turbines, comparison of the different ways of storing wind energy
Other requirements/information	A basic understanding of simple redox reactions is required to understand the subject matter.
Course format	Seminar-style lecture
Credits (ECTS)	2
Lecture hours (LVS)	2
Type of assessment	Written examination (60 minutes)

Climate and Climate Change

Course name	**Climate and Climate Change**
Learning objectives	The aim of this course is to give you an understanding of the different components of the climate system, the processes that govern their variability, the interactions between them, and which drivers and factors lead to climatic changes. The course will familiarise you with key scientific concepts that are necessary for understanding climate and climate changes. At the end of the course you will be able to explain how drivers like the concentration of greenhouse gases are changing and which impacts this has on the climate, also in the context of historic climatic changes. The course will give you a foundation for evaluating statements about climate change that you might hear in the media or from friends and relatives and discuss them critically based on our solid scientific knowledge of the climate system.
Content	The course will cover: Components of the climate system: what are the key climate features of the atmosphere, the oceans, the land surface, and the biosphere?

	Drivers, forcings, feedbacks, and mechanisms in the climate system: what drives the internal variability of the climate and which external forcings, like anthropogenic greenhouse gases, influence it? Measuring and monitoring the climate: how do we quantify climate and how do we create comprehensive data sets from measurements? Past climatic changes: what can we learn about the past from important climate proxies like ice cores or tree ring data? Climate modelling: How do climate models work, and how do we make sure that they indeed work? Attribution of past and present climatic changes: how do we find out what caused those past and present climatic changes that we have observed? Future climate projections and their implications: what are the assumptions and different scenarios that are used for future climate projections?
Other requirements/information	The course is suitable for students from all subject areas and does not require any specific prior knowledge beyond basic school science.
Course format	Seminar-style lecture
Credits (ECTS)	2
Lecture hours (LVS)	2
Type of assessment	Written examination (90 minutes)

Computer Science

Course name	**Computer Science**
Learning objectives	- Basic understanding of algorithms and software engineering - Knowledge about the formalism and utilisation of a high level computer language - Ability in programming distinct tasks - Ability to analyse, understand, and modify simple given computer programs - Knowledge of English computer science terminology
Content	- Algorithms in computer science - Numeral systems and information coding - The program development process, problem analysis, algorithm development, and implementation in a computer language - Programming Python, computing platforms, and Python's development environment - The principle structure of Python programs, variables, operators, key words, expressions, functions and procedures, modules, errors, and debugging - Object-oriented programming, classes, and methods

	- Programming event-driven flows of operation - Practical work with the computer
Other requirements/information	The course is designed for engineering students. Previous knowledge is not necessary.
Course format	Seminar-style lecture
Credits (ECTS)	5
Lecture hours (LVS)	4
Type of assessment	Written examination (90 minutes)

Constructive Conflict Transformation

Course name	**Constructive Conflict Transformation**
Learning objectives	In this seminar we will analyse models of constructive conflict transformation (i.e., mediation, power-model, value-based models, etc.), to discuss challenges in approaching conflicts constructively. After completing the module, you will be able to critically evaluate and develop conflict transformation models by applying social and psychological perspectives. During the seminar you will acquire an understanding of the elements of conflicts (e.g. personal patterns, values, culture, structural aspects). In addition, you will be able to critically evaluate what constitutes a successful conflict transformation model. Finally, you will acquire the skills to apply the discussed models in your professional and personal environment.
Content	The character of the seminar is based on intensive interaction between participants through interactive dialogue and critical discussions. The content of the seminar will be the analysis of social and psychological oriented conflict models, mediation, patterns based on needs and fears, value-based conflicts, and structural aspects of organizational challenges. The seminar is structured in two aspects: (1) interactive introduction to the analysis of conflict models, (2) analysis of personal and structural conflicts by the students
Other requirements/information	The methodological emphasis of the course is on practical exercises and interactive dialogue. Therefore, the successful completion of the course requires active participation in all sessions.
Course format	Seminar-style lecture
Credits (ECTS)	3
Lecture hours (LVS)	3

Type of assessment	Paper

Electromagnetic Compatibility (EMC) in Practice

Course name	**Electromagnetic Compatibility (EMC) in Practice**
Learning objectives	- Basic knowledge of electromagnetic compatibility (EMC), including the basic understanding of international standards and the phenomena which are covered by them - The EMC-conform development of electronic devices, including the design of shielding, the layout of printed circuit boards, and the use and design of EMC filters
Content	The lecture includes the following topics: - International standards for EMC: The international standards for consumer products will be addressed. We will discuss the phenomena behind the standards and where they occur in normal life. - Test procedures according to international standards: Most of the tests will be set up during the lectures. We will learn how to use the test equipment and we will discuss how to improve the devices under test in the case that they cannot pass the test. - How to develop electronic devices: The lecture will provide EMC know-how, how to realize good shielding, how to identify a good EMC-compliant PCB (printed circuit board) layout. The use of EMC filters will also be considered. Experiments related to all of these topics will be covered, to allow participants to test good and bad EMC designs.
Other requirements/information	Electromagnetic compatibility is increasingly important for our life with advancing technology because EMC ensures that devices will not disturb each other by electromagnetic waves. Basic electrotechnics or physics knowledge is necessary for this lecture. Previous knowledge about EMC is not required.
Course format	Seminar-style lecture combined with experiments and practical demonstrations
Credits (ECTS)	5
Lecture hours (LVS)	4
Type of assessment	Written examination (90 minutes)

Fundamentals of Sustainability

Course name	Fundamentals of Sustainability
Learning objectives	Knowledge of the main aspects of sustainability and their interconnections and interdependencies. Assessing comparable environmental impacts of simple products or processes. Apply the principles of circular economy to product life cycles Capability to evaluate thoughts and actions in the context of sustainability.
Content	1. Meaning of sustainability 2. Reasons for sustainability a. Climate b. Well being c. Due diligence 3. Sustainable Development Goals a. Environment b. Social c. Economy 4.Life Cycle Assessment a. Fundamentals b. Norms and standards c. Footprint of product, legal entities and individuals 5. Circular Economy a. For products b. For energy 6. School of thoughts a. Cradle to cradle b. Performance economy c. Biomimicry d. Blue economy e. The natural step
Other requirements/information	English proficiency at level C1
Course format	Seminar-style lecture
Credits (ECTS)	2
Lecture hours (LVS)	2
Type of assessment	Presentation and paper

Generative Design, Additive Manufacturing, and Artificial Intelligence

Course name	**Generative Design, Additive Manufacturing, and Artificial Intelligence in Architecture**
Learning objectives	In this course, students are expected to achieve the following objectives: - Explore different design options for a defined design task using algorithmic and data-driven design approaches - Explore artificial intelligence as an area of research with experimental application in the design process - Develop a design system and a connected building design, which will be presented in a workbook, poster presentation, and 3D-printed architectural model
Content	Based on the learning objectives, students will: - Learn how to use parametric design as a tool for design explorations - Learn the theoretical and philosophical background for the argumentation and application of digital design technology and artificial intelligence - Gain hands-on experience in design and use of advanced algorithms for design tasks
Other requirements/information	The course is designed for students in the programmes in Architecture, Civil Engineering, Design, Media Engineering and other fields of study with keen interest in digital technologies. Experience with computer-aided design is strongly recommended. Knowledge and experience in use of digital design techniques such as 3D-modeling, building information modelling, and parametric design are advantageous. Students must pay about 50 euros for material for the 3D printer.
Course format	Seminar-style lecture
Credits (ECTS)	2
Lecture hours (LVS)	2
Type of assessment	Oral presentation

Global Software Engineering

Course name	**Global Software Engineering**
Learning objectives	The learning objective of this course is integration of programming, software engineering, and project management with intercultural skills to plan, analyse, design, and develop a global software project.
Content	Students will work together with project partners from a university in another country on a real-time simulation of a global software engineering project.
Other requirements/information	Master's level for information systems, computer science, media computer science is required. Prerequisites: - English - Programming skills - software engineering skills - project management skills
Course format	Seminar-style lecture
Credits (ECTS)	5
Lecture hours (LVS)	4
Type of assessment	Project presentation; written report

Health Information Technology Innovation

Course name	**Health Information Technology Innovation**
Learning objectives	In this course, students are expected to achieve the following objectives: - Acquire in-depth knowledge about health information technology innovation based on the needs of the patient, family caregivers, and healthcare professionals. - Design a technology-based solution in the environment of health care (optimise an existing system, create a new solution, or advance a purchased vendor solution). - Experience the key factors for leading a successful implementation.
Content	The course is divided into four parts. It starts with an introduction to information technology application in health care. In this part, all phases of the patient journey are outlined from the perspective of health technology adaptation and process digitalization. In the second part of course selected problem-solving techniques and methods applicable to a health care environment are conveyed

	based on real scenarios. The third part includes methods for planning, running, and managing the implementation of desired solutions. The final part addresses challenges across computerised systems and health information exchange towards digital health transformation. At the end of the course, students will present their designed solution(s) in groups.
Other requirements/information	The course is open for students of all disciplines. No prior knowledge is necessary.
Course format	Seminar-style lecture
Credits (ECTS)	5
Lecture hours (LVS)	4
Type of assessment	Practical course assignment/s, presentation

Introduction to Bionic Computation in Business

Course name	**Introduction to Bionic Computation in Business**
Learning objectives	Course Goals: • Introduction to algorithms which mimic biological systems in nature • Practical application of bionic computation algorithms using analytical information systems to optimise business processes in enterprises Key Outcomes: • Analysis and modelling of business case studies • Application of analytical information systems to optimize business processes • Ability to present project results in oral and written form in English
Content	Theoretical foundations: • Evolutionary Computation • Neural Networks • Swarm Intelligence (e.g. Ant Colony, Particle Swarm) • Sentiment Analysis Practical exercises: • Modelling and analysis of business cases to identify problems • Application of bionic computation algorithms to solve the problems identified in the business cases

Other requirements/information	This course is offered by the Faculty of Computer Science as part of the bachelor's degree programmes in Computer Science. The course is designed for bachelor's students who have experience in computer programming and an understanding of statistics.
Course format	Seminar-style lecture
Credits (ECTS)	5
Lecture hours (LVS)	4
Type of assessment	Project presentation (30 minutes) and project documentation (10 pages)

Introduction to Excel and VBA in Science and Engineering

Course name	**Introduction to Excel and VBA in Science and Engineering**
Learning objectives	In this course, students will be enabled to phrase mathematic formulations from scientific or technical problems, define an approach for a solution as an algorithm, and solve the algorithm with help of Excel and the VBA programming language. After successful completion of the course, students are expected to achieve the following objectives: - use Excel spreadsheets efficiently to solve scientific and engineering problems - use VBA to extend the features of Excel according the requirements of typical scientific and engineering tasks - use VBA to improve efficiency and re-usability of spreadsheets for solutions in their own fields of study - analyse quantitative measurement data with appropriate numerical methods, find appropriate mathematic models, and evaluate the models - solve non-linear equations numerically with help of Excel and/or VBA
Content	- Spreadsheet calculation with Excel - Relative and absolute cell references - Scientific diagrams - General mathematic and statistic Excel functions - User-defined functions in VBA - Linear regression - Non-linear regression - Modifying Excel spreadsheets with VBA - Solving non-linear equations with numerical methods in Excel and/or VBA
Other requirements/information	The course is designed for students in natural science and engineering fields.

Course format	Seminar-style lecture
Credits (ECTS)	2
Lecture hours (LVS)	2
Type of assessment	Written examination (60 minutes)

Introduction to R: Statistical Data Analysis with R for Beginners

Course name	**Introduction to R: Statistical Data Analysis with R for Beginners**
Learning objectives	In this course, students are expected to carry out univariate, bivariate, and multivariate statistical analysis using the R program and R-Studio. The cycle is focused on the implementation of the regression and variance analysis in line with graphical representations for cross-sectional studies.
Content	- Working with R: functions ("q", "sum", "c" etc.), objects and object types (definition and connection of objects, vectors, factors, data frames, saving and loading of objects) as well as arguments (e.g. "digits" etc.) - Working with data sets: data entry, import of data sets, joining data sets, selecting, labeling, recoding, calculating new variables ("dplyr" package) - Univariate statistics: frequency tables, indicators (mean values, variance etc.) - Bivariate and multivariate statistics: contingency measures, correlation coefficients, bivariate and multiple regression, one-way analysis of variance, tests and confidence intervals for cross-sectional studies - Graphics: charts ("ggplot2" package), plot functions, editing of graphics - Brief introduction to "Markdowns" The content is conveyed in an application-oriented manner using exercises. Students will create their own script in R based on the processing of the tasks. At the end of the course they will be able to carry out regression and variance analysis with R independently.
Other requirements/information	The course is designed for students of all disciplines who are interested in statistical evaluations. Basic statistical knowledge is necessary. The course is conducted online.
Course format	Seminar-style lecture (online)
Credits (ECTS)	2

Lecture hours (LVS)	2
Type of assessment	Written assignments

Introduction to SAP ERP

Course name	**Introduction to SAP ERP**
Learning objectives	In this course, students learn the basic technical-organisational concepts of an integrated enterprise resource planning system (ERP system) using the example of SAP ERP based on SAP HANA. This will enable them to understand and evaluate the possible uses and development of such systems in a business context. After completing this course, students will be able to name and explain the basic principles and significance of the in-memory database SAP HANA for companies.
Content	- SAP history - Introduction to SAP ERP - SOA technology and SAP NetWeaver - SAP business suite - SAP user interface - SAP NetWeaver application server with ABAP and Java - SAP components - SAP system administration - SAP workflow and document management - ABAP/4 programming environment - SAP HANA as an in-memory database platform - SAP S/4 HANA based on the SAP HANA platform as a next-generation real-time ERP business suite (digital transformation) Based on the learning objectives, students will: - Learn the basic technology and architecture of the SAP ERP system. - Learn the functionality of SAP HANA. - Understand the technical-organisational relationships between the basic system and the subject-specific application modules. - Plan and implement practical tasks within the scope of system administration. - Be able to demonstrate current development of SAP ERP systems
Other requirements/information	The course is designed for students of all disciplines interested in the use of enterprise software SAP ERP. No prior knowledge is necessary.

Course format	Seminar-style lecture
Credits (ECTS)	2
Lecture hours (LVS)	2
Type of assessment	Oral examination

Introduction to Systemic Design - How to Navigate and Handle Complex Socio-technical Challenges

Course name	**Introduction to Systemic Design – How to Navigate and Handle Complex Socio-technical Challenges**
Learning objectives	Climate crisis, pandemics, international military conflicts, hunger catastrophes - what at first glance seem like isolated issues, are quickly recognised as interrelated expressions of so called “wicked problems”. There are hundreds of opinions on where to start, who to blame, and how to act - our ways of thinking and understanding do not seem suited to navigate and act within those complex challenges. But a school of thought was developed - systems thinking - which creates ways to overcome those inabilities and offers methods and frameworks to think and act in such ambiguous environments. In this course, students will gain familiarity with the following: - Ambiguity competence - Transformative competencies - Understanding complex problems - Systemic design methods and tools - Systems thinking - Designerly approaches of research and learning
Content	- Introduction to thinking in systems o Basic theories and history o Habits of a systems thinker o Dynamic vs. linear thinking approaches - Falling in love with a problem o Systems boundaries exploration o Abstraction levels of a system o Research questions and goals definition - Methods, frameworks, tools o Dynamics, feedback loops, archetypes o Modelling and mapping o Analysis and implications o Strategies and interventions building - Working on custom use, small-scale case scenario in groups - Literature studies - Deliverable: group case study, integration of course deliverables

Other requirements/information	The course is designed for students of all disciplines. Please plan enough of your time for adequate individual and group tasks outside the course hours including literature reviews (reading, understanding, discussing) and practical sessions (applying methods to case studies). Be ready to bring your laptop computers to the course.
Course format	Seminar-style lecture
Credits (ECTS)	3
Lecture hours (LVS)	2
Type of assessment	Group paper and presentation

Light Metals

Course name	**Light Metals**
Learning objectives	Metallic materials that have a density lower than steel are referred to as light metals or alloys. Such metals have particular and increasing importance in engineering, when lightweight construction is required. Especially in the automotive and aircraft industry, light metals are widely used. This course provides a basic understanding of the three main alloy systems in that field, aluminium, titanium, and magnesium alloys. The physical metallurgy of the materials as well as typical processing routes and applications are covered in the course.
Content	After general considerations on materials for lightweight construction, the course teaches basic knowledge for the most common alloys of that materials class. These are wrought aluminium (Al) alloys, cast Al alloys, titanium alloys, and magnesium alloys. For these materials, an introduction into specific aspects of their physical metallurgy is presented and correlated to resulting properties and microstructures. Furthermore, typical ways to process these materials and their main fields of applications are covered.
Other requirements/information	The course is meant to give particular knowledge on metallic materials for lightweight applications. The course is designed to for undergraduate students of materials science and may also be appropriate for other fields of engineering related to mechanics and construction. Basic knowledge of materials science, physics, and chemistry is required.
Course format	Seminar-style lecture
Credits (ECTS)	2
Lecture hours (LVS)	2
Type of assessment	Written examination (90 minutes)

Mathematics I

Course name	**Mathematics I**
Learning objectives	After successful participation in this course students will: - recall and be able to apply basic mathematical notions, methods and tools - classify and extend mathematical problems in single variable calculus and linear algebra (vectors and matrices) - demonstrate knowledge and understanding of basic differential and integral calculus, complex numbers, vectors and matrices and some more advanced techniques of calculus - explain and choose as well as apply fundamental mathematical techniques to solve problems related to economics and natural science - get comprehensive knowledge about correct application of subject-specific terminologies and Vocabulary in English
Content	The course includes the following topics: 1. Functions (single variable) 2. Complex numbers 3. Vectors 4. Linear algebra 5. Differentiation of single variable functions 6. Integrals of single variable functions 7. Sequences, Taylor and power series
Other requirements/information	Course is designed for engineering students. Students should be able to understand the basics of secondary school mathematics (algebra, calculus).
Course format	Seminar-style lecture
Credits (ECTS)	7
Lecture hours (LVS)	6 (+2)
Type of assessment	Written examination (90 minutes)

Mathematics III

Course name	**Mathematics III**
Learning objectives	After successful participation in this course students will be able to: - apply descriptive statistical methods to prepare, illustrate, and analyse data - understand the basic concepts of probability theory - apply theoretical results to compute probabilities and other statistics in practical settings - understand the key concepts of inferential statistics - construct confidence intervals and carry out hypothesis tests in specific settings
Content	The course includes the following topics: 1. Descriptive statistics - graphical illustration of data samples using histograms, box plots, or scatter plots - sample statistics such as sample mean, sample variance, sample covariance, quantiles - linear regression 2. Basics of probability theory - events, probabilities, conditional probabilities, independence - random variables, probability distributions, cumulative distribution function, probability mass function, probability density function - expectation, median, variance, covariance, quantiles - specific probability distributions: binomial, Poisson, geometric, uniform, exponential, and normal distribution - law of large numbers and central limit theorem 3. Inferential statistics - parameter estimation: method of moments, maximum likelihood estimation - confidence intervals for the mean of a distribution - hypothesis tests for the mean of a distribution
Other requirements/information	The course gives a short introduction into statistics and is intended for undergraduate students. Knowledge of fundamentals of mathematics, particularly in analysis, is required.
Course format	Seminar-style lecture
Credits (ECTS)	3
Lecture hours (LVS)	2
Type of assessment	Written examination (90 minutes)

Migration Politics

Course name	**Migration Politics**
Learning objectives	The aim of the seminar is to acquire a thorough knowledge about migration politics in order to understand the current debate on immigration in an academic as well as practice-oriented manner. After the seminar, students will: - be able to distinguish and compare developments of different phases of migration politics and policies and its historical context in Germany and Europe - be able to identify consensus and discordancies about immigration politics among actors in national as well as the EU levels - have gained knowledge about the impact of immigration on politics and the emergence of new actors and their stances on the topic - have gained knowledge about the integration of refugees and migrants, public opinion, diversity, and perspectives for the future - be able to describe central theoretical strands of flight, migration (push and pull factors), and causes of the current flight and immigration flows
Content	To achieve the above-mentioned goals, the seminar is divided into three central parts: 1. <u>Overview</u> To explain the current issues and debate related to asylum and immigration policies, this part explores and classifies the immigration developments and policy changes in the last few decades. It provides insight to better grasp the current debate and understand how and which factors have shaped migration policies and gradually liberalised citizenship laws. In doing so, the EU's role, migrants' perspectives, and their social situation will also be considered. 2. <u>The current state of affairs</u> This part covers various aspects of the debate on immigration, integration, citizenship law, identity, and ethno-cultural diversity. The actors of the current debate and their interests, public opinion, and perspective for the future will be differentiated and classified. Challenges and opportunities posed by migration will be discussed and scrutinized. 3. <u>Push and pull factors</u> This part provides theoretical knowledge about and empirical evidence of the reasons for mobility and immobility in today's world and shed light on the current situation of flight and asylum in Europe as well as Germany.
Other requirements/information	The course is designed for all students of all faculties. Participants should be able to write their term papers in English or German.

Course format	Seminar-style lecture
Credits (ECTS)	2
Lecture hours (LVS)	2
Type of assessment	Paper; presentation

Photojournalism

Course name	**Photojournalism**
Learning objectives	In this course, students will learn the basics of manual photography.
Content	In this course, the basics of manual photography in line with the basics of design theory are explained and practiced. The results are discussed together on a weekly basis. The conclusion of this seminar will be a thematic work in which a series on a given topic will be developed. The final photo series will reflect the contents presented in the course. In addition, an excursion to a design museum/photo exhibition is planned.
Other requirements/information	The course is designed for students who are interested in photography. No prior knowledge is necessary. It would make sense to have a camera that can be adjusted manually. A smartphone is not adequate equipment for the course.
Course format	Seminar-style lecture
Credits (ECTS)	2
Lecture hours (LVS)	2
Type of assessment	Photographic compositions; final submission of a photo series

Research Methods for Engineers

Course name	**Research Methods for Engineers**
Learning objectives	In this course students will: - be provided with a solid foundation of methods to conduct research and scientific projects - be enabled to identify different methods and techniques and get the opportunity to test them in a group assignment - practice working with literature references, presenting results, and communicating conclusions - put concepts and methods into practice and train for realistic situations - be enabled to develop important future skills such as critical thinking, reasoning, problem solving, analytical thinking, and creativity
Content	In this course students will: - learn procedures, methods, and techniques that can be applied in scientific projects - learn to organize their ideas, manage their projects, and increase efficiency - learn to collaborate and work on team assignments - understand how to interpret the results and communicate them
Other requirements/information	Course is designed for engineering students.
Course format	Seminar-style lecture
Credits (ECTS)	2
Lecture hours (LVS)	2
Type of assessment	Presentation

Simulations in Molecular Physics

Course name	**Simulations in Molecular Physics**
Learning objectives	In this course (including a strong focus on practical calculations with commercial software) we will learn and understand how the application of quantum chemical calculations can be an alternative way to gain knowledge in chemistry and any molecule-based natural science e.g. biology, pharmacy, etc.
Content	We will learn about the current orbital-based atomic theory. Based on this atomic model we will understand the periodic table of the elements and the nature of the different chemical bonds. Forming and breaking of these bonds will guide us to the energetics of

	chemical reactions. Based on the intended practical final project we will learn one specialised chemical topic. In the second part of the seminar we will get an overview on computational chemistry and learn on a qualitative level about different quantum chemical methods to calculate molecules. We will learn how we can utilise the calculated data to gain insights in the chemistry and physics of the investigated molecular systems without experiments. Besides the lecture we will do practical exercises in the computer lab to practice for the final project.
Other requirements/information	Participants need no previous knowledge in chemistry or computer science. Interest in natural science and computers is expected. Knowledge in working with spreadsheets is advantageous. The necessary basic knowledge in Linux will be taught.
Course format	Seminar-style lecture
Credits (ECTS)	5
Lecture hours (LVS)	6
Type of assessment	Written assignment

Social Entrepreneurship Cases: Analysing Social Businesses

Course name	**Social Entrepreneurship Cases: Analysing Social Businesses**
Learning objectives	In this seminar we will analyse business models of social businesses (i.e., emerging and existing companies with social and/or ecological objectives), in order to discuss challenges and success factors. After completing the module, you will be able to critically evaluate and develop business models with social and ecological effects. During the seminar you will acquire an understanding of the elements of a business model with socio-ecological goals. You will have the skill to identify the elements of a business model for an existing social business. In addition, you will be able to critically evaluate what constitutes a successful business model with economic and socio-ecological goals. Finally, you will acquire the skills to independently develop existing business models.
Content	The character of the seminar is based on intensive interaction between participants through critical discussions. The content of the seminar will be the analysis of socially and ecologically oriented business models, the target audience analysis of social businesses, the theory of change, impact measurement, and the scaling of social start-ups / social enterprises.

	The seminar is structured in three sections: (1) Interactive introduction to the analysis of socio-ecological business models, (2) Analysis of existing social business cases by the students, (3) Development of their own social business case.
Other requirements/information	Previous knowledge is not necessary for this seminar. An affinity for interactive and reflective work as well as a basic interest in social business are required.
Course format	Seminar
Credits (ECTS)	6
Lecture hours (LVS)	4
Type of assessment	Participation, 2 presentations, and a final paper

Sustainable Buildings - Designing, Constructing and Living Green

Course name	**Sustainable Buildings - Designing, Constructing, and Living Green**
Learning objectives	The main aim of this course is to create an awareness for the buildings we live in. Almost 40% of all global emissions are produced through the building sector. A large proportion of these through housing. By taking a look at the whole life cycle of a building, students will gain an insight into the impact that can be made through designing, planning, constructing, operating, and removing buildings in a green and more environmentally friendly way. There will be a focus on how small decisions regarding the design, materials, or the energy concept can influence the carbon footprint of a building. The overall aim is to develop an awareness for the way we live and to understand how individuals can contribute towards a more sustainable built environment.
Content	After taking a look at the historical development of housing and different ways of living around the world, we are going to study the different disciplines of construction and understand how a more sustainable approach can contribute towards saving resources and reducing our energy consumption. We will not only be looking at individual buildings but different housing concepts and their impact on society. Based on case studies and good practices, both the structural and technical elements of buildings will be examined. The whole life cycle, from the inception to the completion, including the removal and recycling of the building will be taken into consideration. Moreover, the usefulness of building systems and certificates, such as Passive House, DGNB or LEED, will be examined and discussed.
Other requirements/information	All students interested in our built environment or studying something construction related, i.e. architecture, civil engineering, building services engineering, are welcome.

Course format	Seminar-style lecture
Credits (ECTS)	2
Lecture hours (LVS)	2
Type of assessment	Course assignments; presentation

"What's the fuss about Gender?"- Introduction to Gender Studies

Course name	**"What's the fuss about Gender?"- Introduction to Gender Studies**
Learning objectives	Despite the fuss about it in (social) media and politics, many of us do not necessarily know if we feel concern about gender, and consequently, we know little about how to frame and approach new and ongoing debates. In this course, we will take first steps toward understanding and exploring how gender shapes our world.
Content	This course serves as an introduction to gender itself —as a social/cultural construct, as a mode of expression (performativity), and as a critical lens through which we can better understand the world around us. During the semester, we will get acquainted with the field of gender studies as practiced across a range of academic disciplines. We will consider the ways in which gender is produced and performed at the intersection of culture, politics, and the body, always in tandem with other categories of difference such as race, sexuality, and economic class. We will ask how institutions like the government, the workplace, and the family interact with gender. We will contemplate the ways in which ideology (systems of ideas and knowledge) and representation (portrayals in media, political discourse, and everyday life) shape our understanding of gender and how it is produced and reproduced by taking up current (public) debates and conversations (e.g., #metoo movement, abortion rights, LGBTQ+). Rather than assuming that binaries like masculine/feminine, queer/straight, or transgender/cisgender are stable or static concepts, we will work toward understanding how their meanings change over time and space, and how they relate to the broader context of gender in the world today.
Other requirements/information	There are no prerequisites to taking part in this course. Students from all academic disciplines are explicitly encouraged to attend this course. We will discuss some politically and perhaps emotionally charged topics during the semester. Thus, we are called upon to approach these discussions with maturity, intellectual curiosity, emotional care, and an open mind.

	Basic expectation: read. Give yourself time to think about and process the readings. Take notes. Attend lecture and discussion sections. Participate. Think and process more. Assignments: Regular attendance in class, reading the assigned texts, sharing your responses to course material and ideas in class, oral presentation of chosen topic.
Course format	Seminar-style lecture
Credits (ECTS)	3
Lecture hours (LVS)	2
Type of assessment	Reading the texts, participation, presentation

Wind and Geothermal Energy

Course name	Wind and Geothermal Energy
Learning objectives	Upon completion of the course, students should be able to 1. apply the relevant methods of wind energy resource assessment, 2. describe the types and operation of wind turbine generators, 3. evaluate the economic viability and environmental compatibility of wind plants and wind farms, 4. take the necessary steps for the location assessment or site selection for a wind energy plant, 5. report and discuss technological foundations and present them orally as related to specialist and societal problems, 6. describe exploration as well as types and operation of systems for the utilisation of geothermal energy, 7. identify possible applications and select suitable processes and components for the utilisation of geothermal energy, 8. apply the acquired fundamentals for the basic design of geothermal power plants, 9. report and discuss technological foundations of geothermal power, present them orally, and assess and judge practical problems.
Content	- Energy scenarios, report and discuss technological foundations of geothermal power, present them orally, and assess and judge practical problems. renewables, wind as a resource for energy production, - Basic atmospheric concepts, evolution in time, variability and turbulence, wind speed distribution, wind rose, and wind profile - Wind resource measurement, site selection, meteorological instruments, quality and validation of wind resource measurements, representation, and analysis of wind data - Wind turbine generators (WTG): parts of a turbine, classification, power curve, basic concepts of wind turbine aerodynamics, control, grid integration and coupling

	- Wind farm design, micrositing, plant selection, yield prediction and cost efficiency of WTG, logistics of project implementation, onshore and offshore, environmental impact, future trends - Introduction to geothermal energy, fundamental terms, potential, classification of geothermal fields, technical applications - Basics of exploration (drilling) and hauling - Geothermal power plants, thermodynamic fundamentals, components, design criteria - Parameters influencing the realisation of geothermal projects, mining law, licensing, financing, market situation, damage scenarios - Visit to a geothermal power plant
Other requirements/information	Physics or engineering students, who have completed at least 10 credits of thermodynamics, 5 credits of heat transfer, and 5 credits of fluid mechanics. Basic knowledge of materials science and about energy engineering instruments is also sensible.
Course format	Seminar-style lecture, exercises
Credits (ECTS)	5
Lecture hours (LVS)	4
Type of assessment	Written examination