Catalogue of courses offered in English - SoSe 2024

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Dear exchange students,

This catalogue gives you an overview of courses conducted in English at the Ohm in summer semester 2024 that all exchange students can participate in.

One the one hand the catalogue includes electives that are open to all students at the Ohm. Attending these courses you can not only develop your academic knowledge but also gain experience in a truly diverse environment.

One the other hand you can also find courses offered within certain degree programmes that have been opened for exchange students regardless of the degree programme they are enrolled in at the Ohm. You can participate in any course you are interested in as long as you meet the prerequisites.

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.

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Table of Contents

The titles of the courses are either red or blue. Red titles are elective courses, blue titles are standard-curriculum courses.

Bionic Computation in Business

Course name	**Bionic Computation in Business**
Learning objectives	To gain an understanding of the application of bionic computation algorithms for business use cases.
Content	Students work together in project teams to develop applications of bionic computation to solve specific problems in business. Bionic computational algorithms are based on biological systems in nature, such as: - affective computing (sentiment analysis) - artificial neural networks - evolutionary computation - swarm intelligence (ant colony, particle swarm optimisation).
Other requirements/information	This course is offered by the Faculty of Computer Science as part of the master's degree programmes in Information Systems and Management, Computer Science, and Computer Science and Media. The course is designed for master's students who have broad experience in computer programming and an understanding of statistics.
Course format	Seminar-style lecture
Credits (ECTS)	5
Lecture hours (LVS)	4
Type of assessment	Presentation and paper

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-Aided Music Production for Electronic Music Genres

Course name	**Computer-Aided Music Production for Electronic Music Genres**
Learning objectives	- Knowledge of genre-determining songs - Knowledge of different synthesis technologies and their typical sound characteristics - Knowledge of sonic impact of digital effects, dynamic processors, equalizers and their different parameters - Ability to work with Digital Audio Workstations (DAWs)
Content	- History of electronic music genres - Electronic sound synthesis (subtractive synthesis, additive synthesis, FM-synthesis) - Structure and functionality of Digital Audio Workstations (DAWs) - Digital effects (chorus, phaser, flanger, distortion, tremolo) - Dynamic processors (compressor, limiter) - Equalizers - Beatmaking - Song arrangement
Other requirements/information	The course is being offered by the Faculty of Electrical Engineering, Precision Engineering, Information Technology. No specific prerequisites are necessary.
Course format	Workshop
Credits (ECTS)	2.5
Lecture hours (LVS)	2
Type of assessment	Practical course assignment/s

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 organisational 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

CPU Design

Course name	**CPU Design**
Learning objectives	In this course, students are expected to achieve the following objectives: - Gain an overview of modern CPU architectures - Be able to understand and design CPUs at the transistor level - Work with hardware design patterns - Use different simulation tools - Find and debug errors in hardware design
Content	Based on the learning objectives, students will: - Build a 4-bit CPU with TTL chips - Learn how to build a 2-bit CPU at the transistor level - Understand what micro-code is - Design their own assembly language - Learn about modern RISC CPU architectures such as ARM7 and RISC-V - Get an introduction to compiler and virtual machine design This is a hands-on course, meaning that students will actually build a working 4-bit CPU.
Other requirements/information	The course is being offered by the Faculty of Electrical Engineering, Precision Engineering, Information Technology. Familiarity with C, Java, or a similar programming language and experience with electronics and digital logic (FET transistors, multivibrators, flip-flops) are necessary. Participants in the course must pay about 50 euros for electronic components.
Course format	Lecture + labs
Credits (ECTS)	2.5
Lecture hours (LVS)	2
Type of assessment	Oral presentation, written assignments

Economics of Global Environmental Challenges

Course name	**Economics of Global Environmental Challenges**
Learning objectives	Students are able to take an economic perspective on global environmental problems like global warming, the loss of biodiversity, marine pollution, and others. They know and can reflect on the current empirical state of such issues. They can apply fundamental economic tools and models to analyse environmental issues. Students can use economic tools to assess important environmental regulatory policies. They can compare different institutional approaches to environmental policy (regulation, market based, taxes, etc.). They are able to critically reflect on methods of estimating the social value of environmental resources. They are aware of the particularities of global environmental challenges and the specific problems of responding to them. Students gain a comprehensive knowledge about correct application of subject-specific terminologies and vocabulary in English.
Content	The course starts with an assessment of the empirical status quo with respect to biodiversity and global warming. An introduction into economic analysis will be provided and the conditions under which markets fail to generate socially beneficial results will be identified. The problems of public goods and common pool resources will be highlighted and it will be discussed how different economic policy tools (taxes, emission trading, emission ceilings) can or can not deal with them. Different cases of global environmental challenges will regularly be discussed. Finally the issue of global climate change and biodiversity loss will be tackled. The structure of integrated assessment models will be discussed and the question of why policy recommendations based on them produce such varying results will be analysed.
Other requirements/information	The course is offered by the Faculty of Business Administration. It is designed for bachelor's students ideally in business and economics, however, will also be digestable for students of other subjects.
Course format	Seminar-style lecture
Credits (ECTS)	5
Lecture hours (LVS)	4
Type of assessment	Written examination (90 minutes)

Generative Design, Additive Manufacturing, and Artificial Intelligence

Course name	**Generative Design, Additive Manufacturing, and Artificial Intelligence**
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

Health Information System Engineering

Course name	**Health Information System Engineering**
Learning objectives	• The students acquire and develop their knowledge and methods for taking on tasks in application development and information management (development, enhancement, and adaptation based on requirements of sociotechnical information systems). • The students experience the software development cycle from the idea to implementation and understand key factors for successful implementation in the healthcare setting. • The students design a solution in the context of healthcare according to patient data protection (privacy by design) and information security (security by design).
Content	• The course starts with an introduction to information technology application in healthcare environment and deepens knowledge about the development phases of information systems including the specification of requirements •The students then design and program their own application in teams •The students integrate data exchange with a provided database into their application •The students integrate data exchange via HL7 FHIR interface of their application to a provided platform
Other requirements/information	The course is offered within the bachelor's programme in Health Information Management and is also open as an elective to all students. Knowledge of programming and database management systems is recommended.
Course format	Seminar-style lecture
Credits (ECTS)	5
Lecture hours (LVS)	4
Type of assessment	Paper

Hydrogen Technology

Course name	**Hydrogen Technology**
Learning objectives	- Describe the role of hydrogen in an energy system, - Describe the physical and chemical properties of hydrogen, - Provide technical descriptions of the various methods of hydrogen production, storage, transport, and utilisation and describe their advantages and disadvantages, - Establish balance equations of hydrogen energy apparatuses and plants and perform energetic assessments, - Conceptualise a hydrogen-based energy system, - Meaningfully participate in the discussion for the development of hydrogen infrastructure.

Content	- Hydrogen in the past, current, and future energy system
	- Physical and chemical properties of hydrogen
	- Hydrogen production
	  ○ Electrolysis (PEM, alkaline, solid oxide)
	  ○ Biogenic hydrogen from biomass
	  ○ Fossil hydrogen from natural gas
	  ○ New hydrogen production technologies
	- Hydrogen storage and transport
	  ○ Pressurised hydrogen storage (tanks and underground cavern storage)
	  ○ Liquid hydrogen
	  ○ Chemical hydrogen storage and transport
	  ○ Pipelines (mixing in natural gas and pure H2 pipelines)
	- Hydrogen utilisation
	  ○ Fuel cells
	  ○ Hydrogen combustion (hydrogen combustion, gas turbines)
	  ○ Hydrogen in the chemical, petrochemical, and steel industries
	- Hydrogen technology in comparison and in synergy with other energy storage and energy transportation technologies

Other requirements/information	This course is offered as part of the master's programme in Chemical Process Engineering and Process Technology. It is suitable for master's students in engineering or natural science disciplines. Suitable backgrounds are e.g. in chemical process engineering, (technical) chemistry, physics, mechanical engineering, biotechnology, electrical engineering, or industrial engineering. Previous knowledge or extended interest in energy technology, technical and (in)organic chemistry, and thermodynamics are required for a successful participation.

Course format	Seminar
Credits (ECTS)	5
Lecture hours (LVS)	4
Type of assessment	Written examination (90 minutes)

Impact Entrepreneurship - Developing Social and Ecological Innovations

Course name	**Impact Entrepreneurship - Developing Social and Ecological Innovations**
Learning objectives	The aim is to connect students from all Faculties and to enable them to jointly develop interdisciplinary solutions for social and/or ecological problems using innovative methods. Examples of these are acute and global challenges such as biodiversity loss, climate change, environmentally friendly production/additive manufacturing, nutrition, and smart cities. By taking the course, sustainable, impact-oriented action can be experienced and solutions to global problems are developed. Through this course, you will not only learn a range of methods to address global challenges, but also develop a deeper understanding of these challenges, which is especially enhanced through interdisciplinary collaboration.
Content	You will learn advanced knowledge in the field of impact entrepreneurship (i.e., solving social and/or ecological problems through innovative methods). Furthermore, you will learn how to develop your own sustainable solutions for social and/or ecological challenges. In addition to obtaining a foundation of scientifically based content on impact entrepreneurship, you will learn the necessary tools and their application in practice-oriented workshops and will also be personally advised in a team by the interdisciplinary lecturers. Schedule: 1. Kick-off event (topic/problem presentation) 2. Interactive workshops (development of ideas/solutions, business models) 3. Independent development of the project 4. Personal coaching (individual team advice)

	5. Final presentations 6. Submission of the concept
Other requirements/information	The course is open to all students. No prerequisites.
Course format	Seminar-style lecture
Credits (ECTS)	5
Lecture hours (LVS)	4
Type of assessment	Presentation and paper

Intercultural Competence & Leadership

Course name	**Intercultural Competence & Leadership**
Learning objectives	In this course, students are expected to achieve the following objectives: - Learn how to negotiate cultural differences successfully - Explore their own culture and how their values influence their behaviour - Consider unconscious bias and the way they can avoid stereotyping and prejudice - Get acquainted with other cultures to gain a better understanding of the cultural preferences in different countries - Be able to approach intercultural encounters with more sensitivity and understanding, thereby avoiding cultural misunderstandings and potential conflicts - Learn how to build trust across cultures - Learn about culture shock and how to deal effectively with it - Gain multiple perspectives on intercultural topics
Content	- What is culture? - How do values influence behaviour? - Development of intercultural sensitivity - Dimensions of culture - Building trust across cultures - Communicating across cultures - Leadership across cultures - Unconscious bias - The phases of culture shock
Other requirements/information	The course is a part of the 'Industrial Engineering and Management master's programme. It is open for master's students of all disciplines. No prior knowledge is necessary.

Course format	Seminar-style lecture
Credits (ECTS)	5
Lecture hours (LVS)	4
Type of assessment	Course assignment/s, written examination (90 minutes)

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	In a rapidly changing world with numerous and often opposing opinions, beliefs, and goals most of us are simply overwhelmed: How can one possibly make sense of disputed issues like the climate crisis, rapid technological advancements, or multinational military conflicts? This course invites you to develop understanding within complex environments through systemic thinking and design. By studying one simple object in depth we develop insights about world views, technical and social relationships, multiple perspectives, and different models of making sense. This course is for everyone who is curious and loves to learn. In this course, students will gain familiarity with the following topics: ● Ambiguity competence ● Sensemaking in complex environments ● Models as tools of understanding ● Thinking in systems ● Designerly approaches of research and learning

Content	• Introduction to thinking in systems
	  ○ Basic theories
	  ○ Habits of a systems thinker
	• Falling in love with a problem
	  ○ Systems boundaries exploration
	  ○ Abstraction levels of a system
	  ○ Research questions and transformative goals
	• Methods, frameworks, tools
	  ○ Modelling and mapping
	  ○ Analysis, implications, and synthesis
	• Students work on a custom use, small-scale case scenario mostly in groups. You will undertake literature studies.
	• Deliverables:
	  ○ Learning and project portfolio, chapter wise and full scale

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

Mathematics II

Course name	**Mathematics II**
Learning objectives	Demonstrate knowledge and understanding of multivariable calculus, ordinary differential equations, and Fourier series. - Explain and choose as well as apply fundamental mathematical techniques to solve problems related to economics and natural science. - Recognise (or relate) the power of mathematical modelling, analysis, and numerics to application problems. - Make appropriate assumptions to simplify and thus model economical and engineering problems. - Analyse models using mathematical techniques including basic numerical techniques. - Interpret mathematical results and their implications in their economical and engineering context. - Getting comprehensive knowledge about correct application of subject-specific terminologies and vocabulary in English.
Content	- Multivariable functions - Partial derivatives (for functions with more than one independent variable) - Multiple integrals (double and triple integrals) - Differential equations (including method using the Laplace transform) - Fourier series
Other requirements/information	The course is a part of the International Business and Technology bachelor's programme and designed for students who want to study in the following fields: mechanical engineering, electrical engineering, and natural sciences. Understanding the basics of secondary school mathematics is necessary.
Course format	Lecture
Credits (ECTS)	7

Lecture hours (LVS)	6 (+2)
Type of assessment	Written examination (90 minutes)

Nuclear and (Elementary) Particle Physics

Course name	**Nuclear and (Elementary) Particle Physics**
Learning objectives	In this course, students are expected to achieve the following objectives: - Obtain an overview of historical experimental findings in the characterisation of the structure of microscopic matter and the corresponding theories and models - Be able to recapitulate the path from classic atomic physics to modern physics (i.e., quantum mechanical description of microscopic matter) - Gain an overview of the theoretical tools involved in the description of atoms, nuclei, and their substructures and be able to apply these tools for qualitative interpretation and quantitative estimates - Gain an overview on the experimental tools involved in the disclosure of atomic and nuclear substructures and elementary particles - Obtain understanding of nuclear (in)stability and (simple) nuclear models - Obtain understanding of elementary particles and their interaction - Be able to transfer the knowledge from basic research (i.e., above items 1 to 6) to technical applications
Content	Based on the learning objectives, the contents of the course are as follows: - Concepts from Greek philosophers, studies in the course of the alchemy period, findings from chemistry, thermodynamics, and their statistical interpretation, Planck's theory of black body radiation and Einstein's theoretical explanation of the photo effect, Curie's discovery of radioactivity, Thomson's discovery of the electron and his plum pudding atomic model, Rutherford's ground-breaking scattering experiment - Contradictions of Rutherford's atomic model with experimental results, Bohr's quantisation of angular momentum, de Broglie's matter waves, inclusion of the measurement process in atomic theory

	- Basic ideas and formulations of Schrödinger's and Heissenberg's Quantum Mechanics, Einstein's Special Relativity Theory, introduction of the cross section to describe reactions of microscopic structures - Production of high energy particle beams by means of accelerators and detection of particles from microscopic reactions by means of detectors - Nuclear stability diagram, types and nature of nuclear decays, mass deficiency, nuclear droplet model and Bethe-Weizsäcker mass formula, Fermi gas model and extension to more refined nuclear potentials, the nucleon-nucleon-model, and Yukawa's model for the strong nuclear force - Discovery of the "zoo of elementary particles", Salam's and Weinberg's quark-parton-model, the Standard Model of elementary particles and their basic interactions - Introduction to technical applications such as reactors and power plants for nuclear energy production, medical radiation therapy, or radioactive age determination
Other requirements/information	Understanding the basics of classical mechanics, thermodynamics, electromagnetic waves, and atomic physics is necessary.
Course format	Seminar-style lecture
Credits (ECTS)	4
Lecture hours (LVS)	3
Type of assessment	Oral and written examination (presentation + paper)

Scientific Presentation

Course name	**Scientific Presentation**
Learning objectives	In this course, students are expected to achieve the following objectives: - Learn how to design and present scientific posters - Learn how to create and give oral presentations on scientific topics in English
Content	Students will learn about the structure of scientific presentations. The lecture series includes lots of exercises listening to scientific presentations and analysing these presentations. Furthermore, students will discuss advantages and disadvantages of various presentation methods, their strengths and weaknesses. The course also covers a wide range of exercises on creating and presenting scientific posters. A poster, as a final work, will be created as part of the exercises during the lecture series. Poster presentations will be graded at the end of the course.
Other requirements/information	The course is a part of the Applied Chemistry master's programme and open for all master's students of natural sciences. The lectures are presented only in English. Therefore, English level B2 proficiency is necessary.
Course format	Seminar-style lecture + practical exercises
Credits (ECTS)	2
Lecture hours (LVS)	2
Type of assessment	Oral examination, poster

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

Sustainable Development and National Strategies

Course name	**Sustainable Development & National Strategies**
Learning objectives	Upon successful completion of this module students meet the following learning objectives and acquire the following skills: **Learning objectives** • Students explain and reflect the theory and science of sustainable development. • They evaluate economic growth and gain knowledge about different (alternative) growth models. • Students know the planetary boundaries. • They understand the interdisciplinarity of the sustainability concept. • They are able to develop national strategies for sustainability in accordance with the characteristics of different countries. **Subject-specific skills:** • Students define the term “sustainable development” and know its history. • They have critical insight into the topic of economic growth and different growth models. • They understand the concept of ecosystem carrying capacity for human influences limited by population growth and satisfaction of needs. • Students know about eco-footprint and earth overshoot. • They comprehend the different impacts of interference to nature by the economic system: resource extraction and waste accumulation. • Students recognise that continuing growth at current rate of utilisation is unsustainable. **Learning and methodological skills:** • Students answer research questions in the field of sustainable development independently by planning, carrying out, and evaluating analyses of documents and relevant databases. They source information for this purpose independently via the internet. • They are able to apply the concept of sustainable development and formulate national sustainability strategies for industrialised, developing, and underdeveloped countries. **Personal skills:** • Students evaluate their own contribution to sustainable development and develop a picture of how they can develop their abilities to apply sustainability strategies in their own lifestyle and how to teach other people about sustainability.

	Social skills: • Students discuss sustainability-related problems and questions in small groups, and • gain competence to identify, analyse, and provide proposals for solutions. The course gives opportunities to present own ideas.
Content	The science of sustainable development and recent researches on national strategies for sustainable development are presented in this course. The starting point of theory formation is the history and the most often quoted definition: “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs" by the Brundtland Commission with their report “Our Common Future” (1987). The term “sustainable development” has become popular since the UN Conference on Environment and Development held in Rio de Janeiro in 1992. The Brundtland Commission Report (World Commission on Environment and Development, 1987) has made a great contribution by emphasising the importance of sustainable development and by giving the most often quoted definition. The starting point of theory formation is the ethical idea of sustainability. It is based on obligations toward future generations and presupposes intergenerational equity. Concerning specific resources and services (e.g., fresh water, the atmosphere as a carbon sink, the wide variety of ecosystems), it is evident that continuing growth at current utilisation rates is unsustainable. Problems on earth are diverse: underdevelopment, poverty, drought and famine, air pollution, soil degradation, marine debris, climate change, wastage, waste of resources, etc. The aim of sustainable development is to solve all these problems and give all generations (present and future) the opportunity to meet at least their basic needs, known as intragenerational and intergenerational equity. In sustainability science the world is seen as a complex and dynamic big system; some natural processes and cycles are difficult to understand. In this course students will work with a reduced world model consisting of only five natural elements that are necessary to sustain life on earth: air, water, soil, the ozone layer, and sun. The concept of sustainable development (with the descriptors “anthropocentrism”, “nature conservation”, “justice and equity”, “comprehensiveness”, and “long-term durability”) can contribute to finding strategies, principles, and policies for defining national strategies for sustainability. Suitable sustainable development strategies for nations can not be implemented immediately.

	Sustainable development is of concern to everybody and it affects every country in the world, all firms, all regions, all towns, and all households. Sustainable development is an anthropocentric concept. The concept of sustainable development has three main pillars: social, economic, and ecological aspects. A simple world model is the basis for developing strategies to achieve sustainability on the earth. The main limits are the carrying capacity of the earth and the capacity for human impact on resource removal and waste disposal. Both limits are influenced by population growth and the satisfaction of needs. The development of natural elements necessary to sustain life depends on the carrying capacity of the earth. The earth can regenerate if limits are adhered to. The limits of ecosystems have an impact on our economic system if sustainability is achieved. How should humanity deal with natural resources, especially with non-renewables? How should humanity solve problems like poverty and wastage? What are the consequences for world nations? Are there feasible national strategies? All these questions and whether sustainable development is possible or not, will be discussed in this course.
Other requirements/information	The course is open to all students regardless of their degree programme. No prerequisites needed.
Course format	Seminar-style lecture
Credits (ECTS)	5
Lecture hours (LVS)	4
Type of assessment	Presentation and paper