Catalogue of courses offered in English - SoSe 2025

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Dear exchange students,

This catalogue gives you an overview of courses conducted in English at the Ohm in summer semester 2025 that all exchange students can participate in.

On 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.

On 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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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 concrete 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	The course is being 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 per week (LVS)	4
Type of assessment	Report and final 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 per week (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	This 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 per week (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 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 per week (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: o Gain an overview of modern CPU architectures o Be able to understand and design CPUs at the transistor level o Work with hardware design patterns o Use different simulation tools o Find and debug errors in hardware design
Content	Based on the learning objectives, students will: o Build a 4-bit CPU with TTL chips o Learn how to build a 2-bit CPU at the transistor level o Understand what micro-code is, o Design their own assembly language o Learn about modern RISC CPU architectures such as ARM7 and RISC-V o 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 per week (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 benevolent 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 cannot 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 those come up with such varying results will be analysed.
Other requirements/information	The course is being offered by the Faculty of Business Administration. It is designed for bachelor students ideally in business and economics, however, will also be digestible for students of other subjects.
Course format	Seminar-style lecture
Credits (ECTS)	6
Lecture hours per week (LVS)	4
Type of assessment	Written examination (90 minutes)

Engineering Mathematics II

Course name	**Engineering Mathematics II**
Learning objectives	Sound knowledge and in-depth understanding of the mathematical concepts, laws, approaches, and methods specifically relevant to mechanical engineering.
Content	○ Curves (parameterisation of curves, curve discussion of parameterised curves) ○ Multivariable functions (representation and visualisation; continuity; multidimensional differential calculus with applications such as error calculation and extremum problems) ○ Single real variable integration and its applications ○ Integral calculus in several real variables (plane and spatial domain integrals, integration over normal domains, transformation formula (especially polar, cylindrical, and spherical coordinates)) and their applications (calculation of area, volume and centres of gravity of curvilinearly bounded areas in two and three spatial dimensions)) ○ Curve integrals (integrals of vector fields or scalar fields along curves, calculation of curve lengths, calculation and use of potential functions) ○ Ordinary differential equations (linear and non-linear differential equations of the first order, linear differential equations of the second and higher order, linear systems of differential equations)
Other requirements/information	The course is part of the Mechanical Engineering (B.Eng.) curriculum. Basic university-level knowledge in mathematics is required.
Course format	Seminar-style lecture
Credits (ECTS)	5
Lecture hours per week (LVS)	4
Type of assessment	Written examination (90 minutes)

Engineering Mechanics II

Course name	**Engineering Mechanics II**
Learning objectives	Application of basic mechanical laws to elastostatic systems subjected to multiaxial loads, skills for determining mechanical stresses and deformations under multiaxial loads, acquisition of skills for analysing and dimensioning components under static and oscillating loads with regard to safety and economic efficiency.
Content	○ Multiaxial loading: stress and distortion tensor - generalised Hooke's law - tensor transformation - Mohr's stress circle - strength hypotheses - strength verification under static loading. ○ Deformation in tension/compression, bending, torsion and shear: differential equations of the beam and the bending line - analysis of statically indeterminate systems. ○ Strength verification for vibrating loads: stress determination - strength parameters - fatigue strength verification for uniaxial and multiaxial loads.
Other requirements/information	The course is part of the Mechanical Engineering (B.Eng.) curriculum. Basic knowledge in technical mechanics and material sciences is required.
Course format	Seminar-style lecture
Credits (ECTS)	5
Lecture hours per week (LVS)	4
Type of assessment	Written examination (90 minutes)

Ethical Challenges in Global Business and Technology 2 ECTS

Course name	**Ethical Challenges in Global Business and Technology 2 ECTS**
Learning objectives	By the end of this course, students will be able to: ○ Identify and critically evaluate ethical principles, theories, and frameworks relevant to high-technology industries ○ Analyse ethical challenges in emerging technologies, such as artificial intelligence, data privacy, and biotechnology, and assess their implications for business decision-making ○ Understand the influence of cultural norms and values on ethical reasoning and decision-making in global business settings ○ Develop and defend ethical positions through structured arguments and presentations
Content	This course explores the intersection of ethics, intercultural communication, business, and technology in a global context. Designed for master's and advanced bachelor's students, the course equips participants with the analytical skills needed to navigate ethical challenges in high-technology business environments. Students will examine ethical principles, evaluate decision-making processes, and apply ethical frameworks to real-world scenarios. Content Overview: 1. Foundations of Ethics in Business and Technology ○ Introduction to ethical theories and principles: utilitarianism, deontology, virtue ethics, and others ○ Concepts of morality, values, and cultural relativism ○ Ethical decision-making in diverse cultural and business contexts 2. Intercultural Communication and Ethical Challenges ○ Exploring the role of cultural norms and upbringing in shaping ethical perspectives. ○ Managing ethical dilemmas in global and cross-cultural teams. ○ Case studies of intercultural business ethics in practice. 3. Emerging Technologies and Ethical Implications ○ Ethical considerations in artificial intelligence, machine learning, and data privacy

	○ The impact of biotechnology, automation, and digital transformation on society and businesses ○ Environmental ethics and sustainability in technology-driven industries 4. Practical Applications and Skill Development ○ Strategies for ethical leadership and corporate responsibility ○ Debates on contemporary ethical dilemmas
Other requirements/information	Completion of assigned readings and assignments for each session and active participation in class discussions are required.
Course format	Seminar-style lecture
Credits (ECTS)	2
Lecture hours per week (LVS)	2
Type of assessment	Oral presentation

Ethical Challenges in Global Business and Technology 4 ECTS

Course name	**Ethical Challenges in Global Business and Technology 2 ECTS**
Learning objectives	By the end of this course, students will be able to: ○ Identify and critically evaluate ethical principles, theories, and frameworks relevant to high-technology industries ○ Analyse ethical challenges in emerging technologies, such as artificial intelligence, data privacy, and biotechnology, and assess their implications for business decision-making ○ Understand the influence of cultural norms and values on ethical reasoning and decision-making in global business settings ○ Develop and defend ethical positions through structured arguments and presentations ○ Develop critical thinking and problem-solving skills ○ Communicate complex ethical analyses effectively in written academic English
Content	This course explores the intersection of ethics, intercultural communication, business, and technology in a global context. Designed for master's and advanced bachelor's students, the course equips participants with the analytical skills needed to navigate ethical challenges in high-technology business environments.

	Students will examine ethical principles, evaluate decision-making processes, and apply ethical frameworks to real-world scenarios. Content Overview: 1. Foundations of Ethics in Business and Technology o Introduction to ethical theories and principles: utilitarianism, deontology, virtue ethics, and others o Concepts of morality, values, and cultural relativism o Ethical decision-making in diverse cultural and business contexts 2. Intercultural Communication and Ethical Challenges o Exploring the role of cultural norms and upbringing in shaping ethical perspectives. o Managing ethical dilemmas in global and cross-cultural teams. o Case studies of intercultural business ethics in practice. 3. Emerging Technologies and Ethical Implications o Ethical considerations in artificial intelligence, machine learning, and data privacy o The impact of biotechnology, automation, and digital transformation on society and businesses o Environmental ethics and sustainability in technology-driven industries 4. Practical Applications and Skill Development o Strategies for ethical leadership and corporate responsibility o Debates on contemporary ethical dilemmas o Case study analyses to foster critical thinking and problem-solving skills o Academic writing workshops focusing on clarity, argumentation, and citation practices
Other requirements/information	Completion of assigned readings and assignments for each session and active participation in class discussions are required.
Course format	Seminar-style lecture
Credits (ECTS)	4

Lecture hours per week (LVS)	4
Type of assessment	Oral presentation, final paper

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 arrange for 3D-printing independently.
Course format	Seminar-style lecture
Credits (ECTS)	2
Lecture hours per week (LVS)	2

Type of assessment	Oral presentation

Health Economics Evaluation

Course name	**Health Economics Evaluation**
Learning objectives	○ Students use basic theories and concepts from the field of health economics. ○ Students develop an understanding of the impact of decisions in healthcare, taking economic criteria into account. ○ Students select and apply methods of health economic evaluation. ○ Students are familiar with healthcare as an economic problem of allocation and distribution. ○ Students are able to apply the basic principles of economic behaviour as well as the types of costs and benefits relevant to business administration and health economics.
Content	○ Introduction to Health Economics ○ Learning the Fundamentals of Health Economic Evaluation ○ Measurement of Costs and Benefits ○ Assessment of Quality of Life Effects ○ Methods of Health Economic Evaluations: Cost and Disease Cost Studies as well as Comparative Methods ○ Economic Evaluation Methods ○ Assessment and Decision Making ○ Application of Health Economic Evaluation
Other requirements/information	Recommended prior knowledge in health and digitization, hospital management, and applied statistics.
Course format	Seminar-style lecture
Credits (ECTS)	5
Lecture hours per week (LVS)	4
Type of assessment	Written examination (90 minutes)

Health Information System Engineering

Course name	**Health Information System Engineering**
Learning objectives	○ 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). ○ Students experience the software development cycle from the idea to implementation and understand key factors for successful implementation in the healthcare setting. ○ 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. ○ Students then design and program their own application in teams. ○ Students integrate data exchange with a provided database into their application. ○ 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 per week (LVS)	4
Type of assessment	Paper

Hydrogen and Sustainability

Course name	**Hydrogen & Sustainability**
Learning objectives	After successfully completing the module, students should be able to: ○ Understand and explain the role of hydrogen in an energy system ○ Understand and explain the role of hydrogen in the sustainable production of steel ○ Understand and explain the role of hydrogen in the sustainable chemical industry ○ Understand and explain the role of hydrogen in sustainable mobility ○ Assess the sustainability of hydrogen production and utilisation pathways ○ Economically evaluate the use of hydrogen in industry and mobility
Content	○ Hydrogen in a sustainable energy system • Hydrogen production from renewable energy • Hydrogen utilisation in sustainable energy • Sustainability in energy systems & life cycle assessment • Techno-economic assessment ○ Hydrogen in sustainable industry • Hydrogen in the steel industry • Steel production using renewable hydrogen • Sustainability & life cycle assessment • Techno-economic assessment ○ Hydrogen in the chemical industry • Methanol synthesis from CO2 and renewable hydrogen • Ammonia synthesis • Storage and transportation infrastructure • Sustainability & life cycle assessment • Techno-economic assessment

	○ Hydrogen for industrial heating • Heat production using hydrogen • Sustainability & life cycle assessment • Techno-economic assessment ○ Hydrogen in sustainable transportation • Fuel cells • Hydrogen combustion engines • Methanation & E-Fuels • Sustainability & life cycle assessment • Techno-economic assessment
Other requirements/information	Basic knowledge in the areas: ○ Energy technology ○ Thermodynamics ○ Chemistry and materials science
Course format	Seminar-style lecture
Credits (ECTS)	5
Lecture hours per week (LVS)	4
Type of assessment	Presentation, written examination (90 minutes)

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-style lecture
Credits (ECTS)	5
Lecture hours per week (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. It is offered in cooperation with the University of Bayreuth and will take place in Bayreuth.
Course format	Seminar-style lecture
Credits (ECTS)	5
Lecture hours (LVS)	4
Type of assessment	Presentation; paper

Intercultural Competence & Leadership

Course name	**Intercultural Competence & Leadership**
Learning objectives	In this course, students are expected to achieve the following objectives: o Learn how to negotiate cultural differences successfully o Explore their own culture and how their values influence their behaviour o Consider unconscious bias and the way they can avoid stereotyping and prejudice o Get acquainted with other cultures to gain a better understanding of the cultural preferences in different countries o Be able to approach intercultural encounters with more sensitivity and understanding, thereby avoiding cultural misunderstandings and potential conflicts o Learn how to build trust across cultures o Learn about culture shock and how to deal effectively with it o Gain multiple perspectives on intercultural topics
Content	o 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 'Master Industrial Engineering and Management' 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 per week (LVS)	4
Type of assessment	Course assignment/s, written examination (90 minutes)

International Social Work

Course name	**International Social Work**
Learning objectives	After completing the module, students can ○ justify the usefulness and necessity of an international comparative perspective in social work ○ understand the demands on and changes in social work in Germany as a result of global processes ○ identify special features and intersections of social work in selected European and non-European countries ○ identify problems of selected minorities in Europe and outside Europe with a view to historical and political constellation conditions and usefully apply the information for German social work
Content	○ Globalisation processes and social impacts ○ Social work in countries within and outside Europe (exemplary)

	○ Experiencing and reflecting on foreignness ○ Politics against minorities in selected countries
Other requirements/information	The course is part of the Social Work (B.A.) curriculum. It is designed for students of social work. Students from other fields of study with a strong interest in questions of international development and cooperation and a basic background in social sciences are welcome. In summer semester 2025, the course will be held as a hybrid seminar in cooperation with the University of Lodz in Poland. It includes a multi-day excursion to Lodz in early June (estimated cost: 250 €).
Course format	Seminar-style lecture, excursion
Credits (ECTS)	6
Lecture hours per week (LVS)	4
Type of assessment	Paper

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 per week (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, labelling, 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 per week (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 per week (LVS)	2
Type of assessment	Oral examination

Mathematics II

Course name	**Mathematics II**
Learning objectives	○ Demonstrate knowledge and understanding of multivariable calculus, ordinary differential equations, and Fourier series ○ Explain, 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 ○ Get 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 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 per week (LVS)	6 (+2)
Type of assessment	Written examination (90 minutes)

Scientific Presentation

Course name	**Scientific Presentation**
Learning objectives	In this course, students are expected to achieve the following objectives: o Learn how to design and present scientific posters o 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 on listening to scientific presentations and analysing these presentations. Furthermore, students will discuss advantages and disadvantages of various presentation methods, their strength and weaknesses. The course also covers a wide range of exercises on creating and presenting scientific posters. A Poster, as a final work, can 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 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 per week (LVS)	2
Type of assessment	Oral examination, poster

Space Systems

Course name	**Fundamentals of Space Systems Engineering**
Learning objectives	Spaceflight is currently undergoing a phase of commercialisation: The "New Space" approach, characterised by shortening development cycles, using new technologies, and agile development approaches, is becoming increasingly important for the entire spectrum of space companies from start-ups to large-scale integrators. This course provides a foundational understanding of various types of space missions and their associated satellites, spacecraft, and orbits. It explores a wide range of applications, including Earth observation, astronomy, telecommunications, navigation, and planetary exploration. By the end of the course, students will have a solid grasp of the processes and methodologies involved in designing, developing, and operating space systems. They will gain insight into technical readiness levels, the typical phases of space projects, and fundamental principles of systems engineering, including the V-model. The course equips students with the ability to assess the complexity of space missions and the technologies required to realise them.
Content	This course equips students with the knowledge and tools to analyse, design, and evaluate space missions and technologies: ○ History of Spaceflight: A journey through the milestones of space exploration ○ Types of Space Missions: An overview of mission categories and their objectives ○ Orbit Mechanics: Characteristics and classifications of satellite orbits and spacecraft trajectories ○ Space Systems: Exploration of launch vehicles, satellites, and their subsystems ○ Rocket Propulsion: From the fundamental rocket equation to advanced propulsion systems like turbo engines ○ Attitude and Orbit Control Systems (AOCS): Principles and mechanisms for spacecraft orientation and orbit management ○ Space Environment: Challenges posed by radiation, extreme temperatures, and vacuum conditions ○ Materials Science and Lightweight Construction: Designing durable and efficient space structures

	○ Satellite Payload Development: Design and evolution of optical, radar, and other payloads for Earth observation, science, telecommunications, and navigation ○ Earth Observation and Atmospheric Research: Utilising space technologies to monitor air quality, climate change, and other environmental factors ○ Space Project Development Cycles: An introduction to the V-model, technical readiness levels, and the phases of space system development
Other requirements/information	A foundational understanding of high school-level mathematics and physics is required for this course, and basic knowledge of Python is advantageous.
Course format	Seminar-style lecture
Credits (ECTS)	2
Lecture hours per week (LVS)	2
Type of assessment	Written examination (90 minutes)