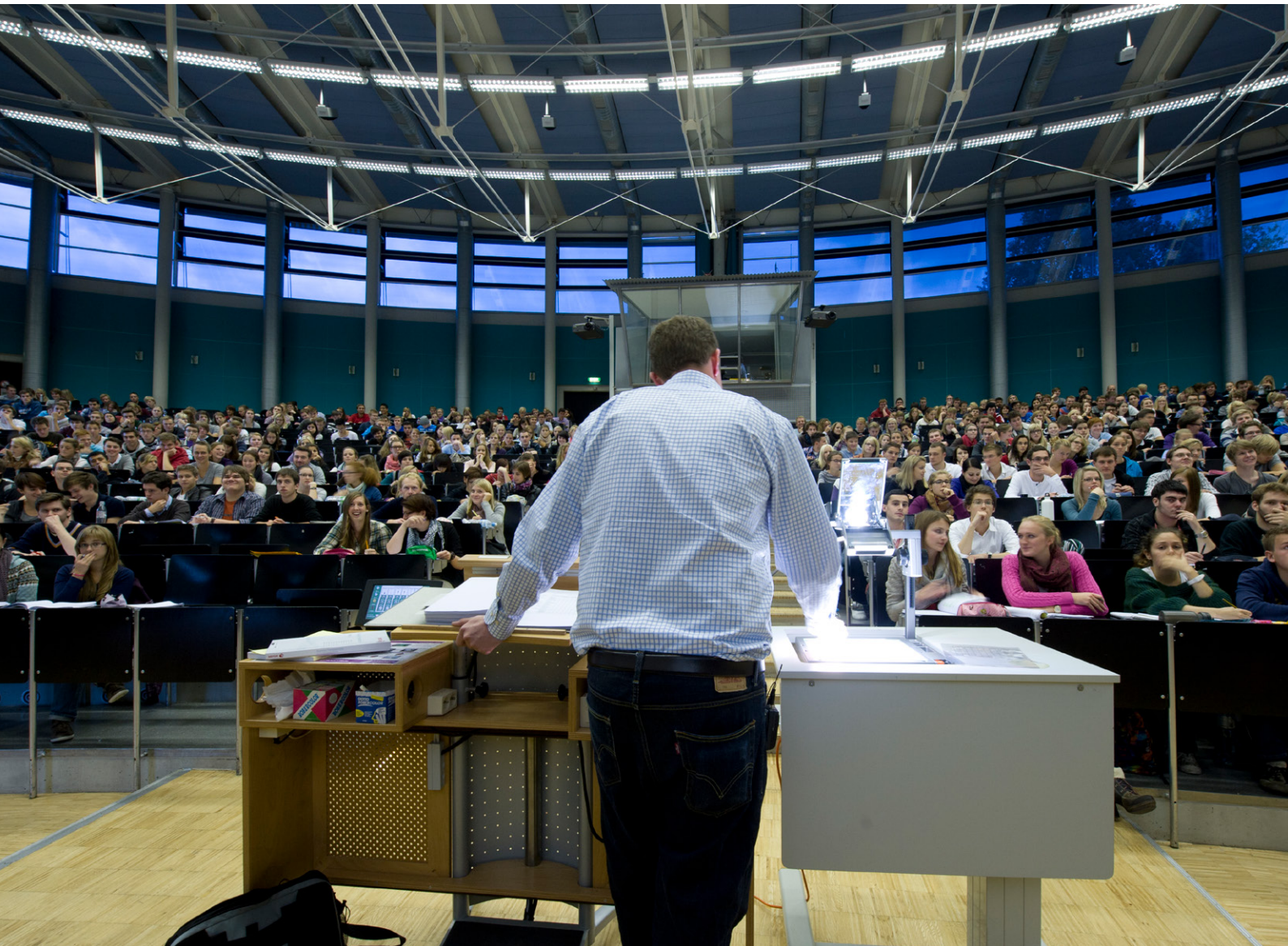
UNIVERSITÄT BAYREUTH

INTERNATIONAL OFFICE

General Overview of English-Taught Courses at the University of Bayreuth

Available during the Winter Semester 2023/24

An overview for the summer semester 2024 is expected to be available as of 01.04.2024



Faculty of Life Sciences: Food, Nutrition and Health

Number	Course Title	Type	ECTS / Credits	Duration	Module Description
76261	AI Ethics and Regulation	S	5	2	AI Ethics and Regulations is a comprehensive and interdisciplinary course designed to explore the ethical implications, societal impact, and legal frameworks surrounding the development, deployment, and use of artificial intelligence (AI) systems. This course aims to equip students with a deep understanding of the ethical challenges posed by AI technologies and the regulatory measures necessary to ensure responsible AI adoption. This course will cover: - What is an AI system - technological, regulatory perspectives - Fundamental issues in AI Ethics and what they mean - Privacy and data protection in AI, ethical AI in specific domains
70194	Case Studies (Food Quality and Safety)	S	7	1	The course offers food quality and safety students an insight into practical scientific work and better prepares them for their master's thesis by requiring students to work on an interdisciplinary research topic themselves. In the process, the execution of a research project is simulated in mini scale. During this course, (1) the students design their research project, (2) they collect and analyse data, (3) they present the research proposal at the interim presentation as well as final results at the end presentation, and (4) they submit the first draft of the report and have to review the draft report of a companion group. The students have (5) to comment on the suggestions for improvement from the peer review, how they have taken them into account in their work or why they have decided against them. This is done in the letter of response, which they submit together with the (6) final version of the report. In this way, the students experience how a research process is carried out, which is close to the reality of a research project. Students work in teams of two or three on challenging interdisciplinary problems regarding food, nutrition and health. Teaching teams form, hand out the problem and support the students in their research through regular meetings and critical feedback. Results are presented in writing and in oral interim and end presentations. The latter is integrated into a joint seminar. Students have to peer review another group's case study reports and submit a written review. In addition, they have to give feedback to the other groups during the interim and end presentation.
70695	Crop Plant and Animal Biology	Le	4	4	Components of eukaryotic cells and their functions; Morphology and anatomy of plants and mammals; Basics in molecular biology and cell signalling; Principles of energy metabolism; Major catabolic and anabolic pathways; Basics in genetics; Agriculture and global biogeochemical cycles; Practical lab work with basic methods in molecular biology and biochemistry
70749	Crop Plant and Animal Biology	Lab	2	3	
70727	Data Analysis and Statistics	Le	6	2	Types of data; descriptive statistics; inferential statistics; data visualisation
70728	Data Analysis and Statistics	S		2	Types of data; descriptive statistics; inferential statistics; data visualisation
70452	Introduction to Statistics and Data Analysis	Le	6	2	Data types and their implications; indicators for data quality; probability theory; basics of hypothesis testing; descriptive statistics; basic inferential statistical methods (chi-square test, t-tests, variance analyses, regression analyses)
70453	Introduction to Statistics and Data Analysis	S		2	Data types and their implications; indicators for data quality; probability theory; basics of hypothesis testing; descriptive statistics; basic inferential statistical methods (chi-square test, t-tests, variance analyses, regression analyses)
71262	Exercises re. Generative AI	Tu		2	
70642	Food & Society	Le	5	2	Sociological Perspectives on Food and Nutrition; Food at Home and Food in Public; Food and Identity; Food and Migration; Food in the Media and Digital Food Cultures; Transforming Food Cultures
70646	Food Quality and Food Authenticity Law	S	4	2	The course offers students an introduction to key topics of food quality and food authenticity, in particular on labeling. The course is based on a research-based learning methodology and requires students to conduct small research projects under the guidance of the mentors. Guest lecturers will be involved and excursions might take place.
70081	Food Trade Law	Le	4	2	This course offers an overview of Global Economic Law, with an emphasis on the food aspects. It will introduce students to the treaty architecture of the World Trade Organization (WTO) and certain other regional trade arrangements. Topics will include the historical, legal and regulatory rationale as well as political economy of the international trade framework, the relationship between international and domestic law and regulation, in particular in the light of state arbitration and compliance issues, the standard-setting and the WTO dispute resolution system. Particular attention will also be directed to the Agreement on Technical Barriers to Trade and the Agreement on the Application of Sanitary and Phytosanitary Measures.

Number	Course Title	Type	ECTS / Credits	Duration	Module Description
70082	Food Trade Law	Tu	-	2	This course offers an overview of Global Economic Law, with an emphasis on the food aspects. It will introduce students to the treaty architecture of the World Trade Organization (WTO) and certain other regional trade arrangements. Topics will include the historical, legal and regulatory rationale as well as political economy of the international trade framework, the relationship between international and domestic law and regulation in particular in the light of state arbitration and compliance issues, the standard-setting and the WTO dispute resolution system. Particular attention will also be directed to the Agreement on Technical Barriers to Trade and the Agreement on the Application of Sanitary and Phytosanitary Measures.
71261	Generative AI - From Sequences to ChatGPT	Le	-	2	Week 1-2: Introduction to Machine Learning and Deep Learning; Introduction to Artificial Intelligence and Machine Learning; Perceptron and Multilayer Perceptron (MLP), Backpropagation and Gradient Descent, Activation Functions; Deep Learning and Feedforward Neural Networks Week 3: Autoencoders and Variational Autoencoders (VAEs); Introduction to Autoencoders, Undercomplete and Overcomplete Autoencoders, Denoising Autoencoders; Variational Autoencoders (VAEs), Latent Space and Sampling from VAEs Week 4: Time Series Forecasting and Autocorrelation; Introduction to Time Series Data, Autocorrelation and Time Series Analysis; Moving Average and Exponential Smoothing Methods, Autoregressive Integrated Moving Average (ARIMA) Week 5-6: Bayesian Regression and Generative Models; Introduction to Bayesian Regression, Bayesian Inference and Maximum Likelihood Estimation; Introduction to Generative Adversarial Networks (GANs), GAN Architecture and Training Week 7-8: Word Embeddings and Sequence Learning; Word Embeddings (Word2Vec, GloVe); Recurrent Neural Networks (RNNs), Long Short-Term Memory (LSTM) and Gated Recurrent Units (GRUs) Week 9-10: Attention Mechanism and Transformer Models; Introduction to Attention Mechanism, Self-Attention and Multi-Head Attention, Transformer Architecture; Introduction to GPT-2 (Generative Pre-Trained Transformer 2), Training and Fine-Tuning GPT Week 11-12: Reinforcement Learning with Human Feedback; Introduction to Reinforcement Learning, Markov Decision Process (MDP) and Q-Learning, Policy Gradient Methods; Deep Reinforcement Learning, Human Feedback in Reinforcement Learning Week 13-14: Explainability and Model Interpretability; Importance of Model Interpretability, Local Interpretable Model-Agnostic Explanations (LIME); SHAP (SHapley Additive exPlanations), Explainable AI Techniques for Deep Learning Models; AI Alignment: Ensuring AI Goals Align with Human Values, AI Safety and Beneficial AI Research"
70586	Global Careers in Food, Nutrition and Health	Le	2	2	
70578	Global Health Policy	Le	5	2	
00344	Group Seminar Nutritional Biochemistry	S	-	2	Group seminar for students that are supervised during their master's or bachelor's thesis in the Nutritional Biochemistry research group
77261	Hands-On Exploration with Wearables for Physical and Mental Health	S	5	2	Wearable technology has become one of the core technologies in the digitalized healthcare era. The ability to record and interpret human-borne signals through wearables such as a smartwatch or a motion capture suit on the fly led to much exciting advancement in in-the-wild physical and mental health health and wellbeing monitoring. This module aims to provide hands-on experiences for the students regarding wearable technologies for physical and mental health. The topics covered in this module are: inertial measurement; Smartwatch technologies and healthcare; Mobile (rehabilitation) technologies
70579	International Nutrition Politics	S	5	2	
70386	Introduction to Excel for Scientific and Business Applications	S	4	2	In this course you will learn how to: Skillfully operate and manipulate worksheets and workbooks; Implement various formulas, functions, and conditional formatting to identify and analyze different data; Import, edit, and clean data from various external sources; Describe, show, and summarize the main characteristics of datasets using statistical analysis; Analyze data using PivotTables and PivotCharts and create dashboards; Visualize summarized data using interactive charts; Perform various what-if analyses using Excel Solver
70735	Introduction to Law and Food Law	Le	5	2	The purpose of the course is to provide students with a well-rounded introduction to law, with a specific focus on EU law, international law, and food law. The course is divided into four thematic areas, starting with a simple introduction to law, followed by an introduction into European law and food law specifically. Afterwards, basic information on international law are provided to prepare students for the following courses. Finally, the last thematic area provides insights into legal research and legal writing.
70736	Introduction to Law and Food Law	Tu	-	2	The purpose of the course is to provide students with a well-rounded introduction to law, with a specific focus on EU law, international law, and food law. The course is divided into four thematic areas, starting with a simple introduction to law, followed by an introduction into European law and food law specifically. Afterwards, basic information on international law are provided to prepare students for the following courses. Finally, the last thematic area provides insights into legal research and legal writing.
70652	Food Microbiology	Le	4	2	Microorganisms; Food spoilage; Foodborne illness; Food preservation; Principles of hygiene concepts e.g. HAACP; Microorganisms in food production (e.g. fermentation); Microbiome in human health"
70581	Theories of Policy Change	S	8	2	

Number	Course Title	Type	ECTS / Credits	Duration	Module Description
70615	Introduction to Programming with Python for Digital Health & AI	Le	8	3	Computer programming has become one of the core-desirable skills within both academic and industrial settings. The versatility of modern computer languages, the abundance of data, and a high-powered computational device lead to swift progress in many fields of research and industry, especially in health-care where rapid digitization allows research to be accomplished using computer simulation and machine learning. This module aims to teach students the fundamental of computer programming and data science through one of the most popular programming languages due to its readability and flexibility: Python. In this module, students will learn: Fundamentals of computer programming in Python; Core design philosophy (procedural and object oriented) and their differences; How to use effective common design patterns in Python; Introduction to popular standard libraries; Introduction to popular data science and deep learning libraries for digital health and AI
70583	Maternal and Child Nutrition Policy	S	-	2	
70393	Method Seminar for Bachelor and Master Students	S	-	2	
70265	Method Seminar in Digital Health and Data Science	S	-	2	This seminar is focused for students studying and working on research projects within the topic area AI, Digital Health or Data Science (e.g. chair of Digital Health). Core training aim is learning to discuss, evaluate and present ongoing research in the context of existing research. The overarching aim is in establishing and cultivating a research culture through regular meetings can have a profound impact on the productivity of a group as well as of individual lab members. These objectives are identified and defined by the participants with feedback from their peers and the professor. The seminar provides a safe environment for research members to practice communication skills, decision-making, problem solving, critical thinking, and collaboration. The aim of the seminar is to research and discourse, within and beyond the lab. The benefits is that they give research group members a sense of participation, integration, and inclusion among a diverse lab community, and leverage the diversity of experiences and skills of lab members.
70658	Food Metabolome and Toxicology	Lab	2	3	
70597	Reinforcement Learning for Scientists & Engineers	Le	5	2	Please note that there is a tutorial (No. 70261) that goes along with this lecture. The course provides both basic and advanced knowledge in reinforcement learning across three core skills: theory, implementation, and evaluation. Students will learn the fundamentals of both tabular reinforcement learning and deep reinforcement learning, and will gain experience in designing and implementing these methods for practical applications. Specifically, students will: Learn the theoretical foundations of reinforcement learning (Markov decision processes and dynamic programming). Learn the algorithmic foundations of reinforcement learning (temporal difference and Monte-Carlo learning); Gain experience in framing low-dimensional problems and implementing solutions using tabular reinforcement learning; Learn about the motivation behind deep reinforcement learning and its relevance to high-dimensional applications, such as playing video games, and robotics; Discover the state-of-the-art deep reinforcement learning algorithms such as Deep Q Networks (DQN), Proximal Policy Optimisation (PPO), and Soft Actor Critic (SAC); Implement and experiment with a range of different deep reinforcement learning algorithms in Python and PyTorch, and learn how to visualize and evaluate their performance. Learning outcomes: Upon completion of this module, students should be able to: Describe the core principles of autonomous systems learning; Calculate mathematical solutions to problems using reinforcement learning theory; Compare and contrast a range of reinforcement learning approaches; Propose solutions to decision making problems using knowledge of the state-of-the-art; Translate mathematical concepts into software to solve practical problems using Python and PyTorch; Evaluate the performance of a range of methods and propose appropriate improvements; Prepare clear visualizations of complex data to assist with evaluation; Monte-Carlo Learning; Temporal Difference Learning The second half of the course will include: Motivation for function approximation: High-dimensional state and action spaces; Continuous state and action spaces; Deep Q-learning: Q update through back propagation; Experience replay buffer Target and Q networks; Policy gradients: The REINFORCE algorithm; Policy update through back propagation; Proximal Policy Optimisation Advanced topics: Soft Actor Critic Learning from demonstration Model-based reinforcement learning
70361	Introduction to Programming with Python for Digital Health & AI	Tu	-	1	
70261	Reinforcement Learning for Scientists & Engineers	Tu	-	1	
70696	Food Metabolome and Toxicology	Le	3	2	A solid understanding of food chemistry, including macro and minor components, minerals, trace elements, vitamins and phytochemicals; Basic understanding of residues and contaminants; Toxicological effects, critical values including supporting examples; Basic principles of the metabolism of xenobiotics (ADME - Absorption, Distribution, Metabolismus und Elimination)

Key/Abbreviations:

Cq Colloquium
ECTS Credit Points
Lab Lab course
Le Lecture
S Seminar
Tu Tutorial

Please check availability of your chosen subject/course by contacting the respective faculty.

You can find contact details at www.uni-bayreuth.de/en/study

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