Übersicht Kursangebot auf Englisch / Overview of courses in English

BERGISCHE UNIVERSITÄT WUPPERTAL

FK / School	Nummer / Number (StudiLöwe)	Titel der Veranstaltung / Title of course	Verantsaltungs-art (Vorlesung, Seminar, E-Learning, Präsenz) / Type of course (Lecture, seminar, e-learning, presence)	Semester (WiSe, SoSe / winter term/ summer term)	Dozent*in / Instructor	Level (BA, MA)	ECTS (Leistungspunkte / Credit points)	Semester-wochen-stunden / Semester hours per week	Kursbeschreibung / Course description
4 - School of Mathematics and Natural Sciences	PHYSDAM	Advanced Data Analysis	Vorlesung	SoSe	Dr. Dominic Hirschbühl	MA	5	4	Students master advanced mathematical concepts and methods for the analysis of measurement data. They are able to determine physical parameters using the extended maximum likelihood method. They can apply these methods especially in the field of data analysis of experimental particle physics.
4 - School of Mathematics and Natural Sciences	PHYSDAU	Advanced Data Analysis	Übung	SoSe	Dr. Dominic Hirschbühl	MA			apply.
4 - School of Mathematics and Natural Sciences	MAT044000	Computational Finance I (Numerische Finanzmathematik)	Vorlesung	SoSe	Dr. Long Teng, Lorenc Kapllani	MA	8	6	The students are familiar with basic concepts in Computational Finance. They have learnt how to model in finance, develop and use simulation tools and judge their efficiency and practicability in front offices.
4 - School of Mathematics and Natural Sciences	MAT044001	Computational Finance I (Numerische Finanzmathematik)	Übung	SoSe	Dr. Long Teng, Lorenc Kapllani	MA			
4 - School of Mathematics and Natural Sciences	BIO426666	Current Topics in Cell Biology and Genetics	Vorlesung	SoSe	Prof. Dr. Martin Simon	MA			The basics of recognizing and assessing biomolecules will be deepened and used as a basis for epigenetic research questions. Current issues related to genetics, epigenetics and RNA biology will be explored. Biology and the social relevance of e.g. epigenetic and medical topics are dealt with.
4 - School of Mathematics and Natural Sciences	PHYMTPDPV	Detectors and Methods in Particle and Astroparticle Physics	Vorlesung	SoSe	Prof. Dr. Wolfgang Wagner, Dr. Paul Jean Schütze, apl. Prof. Dr. Christian Hölbling	MA	8	6	Students will be able to name and explain the physical principles and components of particle accelerators. and explain them. They are able to perform simple calculations of linear beam optics. The students can describe in detail the interactions of particle radiation of various types with matter and relate them to techniques, methods and construction elements of modern detectors and experiments in particle and Particle and particle astrophysics. The students are able to discuss the possibilities and problems of different of different types of detectors. They can precisely explain the use and interaction of detectors in large-scale experiments.
4 - School of Mathematics and Natural Sciences	2020PHYMSTPS	Detectors and Methods in Particle and Astroparticle Physics	Übung	SoSe	Prof. Dr. Wolfgang Wagner, Dr. Paul Jean Schütze, apl. Prof. Dr. Christian Hölbling	MA			
4 - School of Mathematics and Natural Sciences	211PHYMSMTPU	Seminar on Particle Physics	Seminar	SoSe	Prof. Dr. Wolfgang Wagner, Dr. Paul Jean Schütze, apl. Prof. Dr. Christian Hölbling	MA			
4 - School of Mathematics and Natural Sciences	PHYGETAV	Foundations of Elementary Particle and Astroparticle Physics	Vorlesung/Übung	SoSe	Prof. Dr. Wolfgang Wagner, Prof. Dr. Karl-Heinz Kampert, Prof. Dr. Jana Günther	MA	8	6	Mastering the structure of theStandard Model of elementary particle physics and possible extensions of it. Acquisition of the principles for thedetermination of particle properties and reactions at particle accelerators, both theoretically and experimentally. The students are able to understand the interconnection between particle and astroparticle physics. They can explain the mechanisms underlying the origin of cosmic rays and understand how to detect cosmic rays experimentallly.
4 - School of Mathematics and Natural Sciences	PHYMEQFTV	Introduction to Quantum Field Theory	Vorlesung	SoSe	Prof. Dr. Hermann Boos	MA	8	4	The students shall be enabled to carry out modern research in the field of theoretical particle physics and its computer assisted applications.
4 - School of Mathematics and Natural Sciences	PHYMEQFTU	Introduction to Quantum Field Theory	Übung	SoSe	Prof. Dr. Hermann Boos	MA			
4 - School of Mathematics and Natural Sciences	MAT062300	Nonlinear Optimization	Vorlesung/Übung	SoSe	Prof. Dr. Kathrin Klamroth, Dr. Michael Stiglmayr, Prof. Dr. Claudia Totzeck	MA	9	4+2	Existence and uniqueness statements for optimization problems with interacting particle systems and the associated first-order optimality conditions, algorithms for computing optimal controls.
4 - School of Mathematics and Natural Sciences	MAT032200	Numerical Analysis and Simulation II (PDEs)	Vorlesung	SoSe	Prof. Dr. Matthias Ehrhardt, Dr. Zuzana Buckova	MA	8	6	Students are familiar with complex algorithms for the numerical simulation of partial differential equations and are able to analyze and classify them, apply them properly and develop them further.
4 - School of Mathematics and Natural Sciences	MAT032201	Numerical Analysis and Simulation II (PDEs)	Übung	SoSe	Prof. Dr. Matthias Ehrhardt, Dr. Zuzana Buckova	MA			
4 - School of Mathematics and Natural Sciences	211CSISMNM2bV	Numerical Methods in Classical Field Theory and Quantum Mechanics	Vorlesung/Übung	SoSe	Dr. Tomasz Korzec	MA	8	4	
4 - School of Mathematics and Natural Sciences	MAT507100	Parallel Algorithms	Vorlesung	SoSe	Prof. Dr. Matthias Bolten	MA	8	6	The students know the special algorithmic demands in High Performance Computing. They are able to design parallel algorithms and to analyze them, in particular with respect to efficiency.
4 - School of Mathematics and Natural Sciences	MAT507101	Parallel Algorithms	Übung	SoSe	Prof. Dr. Matthias Bolten	MA			
4 - School of Mathematics and Natural Sciences	211CSISMIMG1aV	Quantitative Medical Imaging	Vorlesung/Übung	SoSe	Prof. Dr. Markus Axer	MA	8	4	
4 - School of Mathematics and Natural Sciences	CHE316200	Quantum Theory of Molecules	Vorlesung	SoSe	Prof. Dr. Per Jensen, Dr. Alexey Alekseev	MA	8	6	
4 - School of Mathematics and Natural Sciences	CHE316201	Quantum Theory of Molecules	Übung	SoSe	Prof. Dr. Per Jensen, Dr. Alexey Alekseev	MA			
4 - School of Mathematics and Natural Sciences	PHYMSL2V	Superconductivity II	Vorlesung	SoSe	Prof. Dr. Christian Heß	MA	3	2	The lecture provides an introduction to the physics of unconventional superconductors, in particular high-temperature superconductors. The most important classes of materials are introduced and corresponding experimental data from key experiments are discussed.
4 - School of Mathematics and Natural Sciences	221PHYMSMTPV	The Standard Model of Elementary Particle Physics	Vorlesung/Übung	SoSe	Dr. Stephan Dürr, Prof. Dr. Ekaterina Lipka, Prof. Dr. Wolfgang Wagner	MA	8	6	The students learn the properties and foundations of the Standard Model of Elementary Particle Physics.

4 - School of Mathematics and Natural Sciences	MAT515000	Tools	Vorlesung/Übung	SoSe	Dr. Holger Arndt	MA	3	2	version control systems (git), script languages (Python), Fortran, combination of different programming languages, profiling, numerical libraries (BLAS, LAPACK, ScaLAPACK), important data structures (trees, hash tables)
4 - School of Mathematics and Natural Sciences	PHYMFQMV	Advanced Quantum Mechanics	Vorlesung	WiSe	Prof. Dr. Andreas Klümper	MA	8	6	The students learn advanced methods and techniques of quantum mechanics, inparticular the relativistic formulation and the field quantization. They will gain an overview of various
4 - School of Mathematics and Natural Sciences	PHYMFQMU	Advanced Quantum Mechanics	Übung	WiSe	Prof. Dr. Andreas Klümper	MA			
4 - School of Mathematics and Natural Sciences	CSISMCSim1bV	Block Course on Mathematical Foundations	Vorlesung	WiSe	Dr. Jan Plagge, Dr. Stephan Dürr, Dr. Tomasz Korzec, Prof. Dr. Francesco Knechtli	MA	2	1	Differential and integral calculus (in several dimensions). Matrix calculus.
4 - School of Mathematics and Natural Sciences	MAT041000	Computational Finance II	Vorlesung	WiSe	Dr. Long Teng, Lorenc Kapllani	MA	8	6	Financial derivatives have become an essential tool for the control and hedging of risks. The crucial problem consist in the determination of the fair price of a financial derivative, which is based on mathematical methods. Simple models apply the Black-Scholes equation, where an explicit formula of the corresponding solution exists. More complex models do not allow for an
4 - School of Mathematics and Natural Sciences	MAT041001	Exercises for Computational Finance II	Übung	WiSe	Dr. Long Teng, Lorenc Kapllani	MA			
4 - School of Mathematics and Natural Sciences	PHYMNMvMV	Computational Materials Science	Vorlesung	WiSe	Prof. Dr. Reinhard Hentschke	MA	8	2	Introduction to Mathematica. The Finite Element Method. Asimulation with Monte Carlo and Molecular Dynamics.
4 - School of Mathematics and Natural Sciences	PHYMTPDPV	Detectors and Methods in Particle and Astroparticle Physics	Vorlesung	WiSe	Dr. Paul Jean Schütze, Prof. Dr. Wolfgang Wagner	MA	8	6	Detectors and Methods in Particle and Astroparticle Physics. Students will be able to name and explain the physical principles and components of particle accelerators. They are able to perform simple calculations of linear beam optics. Students will be able to describe in detail the interactions of particle radiation of various types with matter and relate them to techniques,
4 - School of Mathematics and Natural Sciences	PHYMTPDPU	Exercises Detectors and Methods in Particle and Astroparticle Physics	Übung	WiSe	Dr. Paul Jean Schütze, Prof. Dr. Wolfgang Wagner	MA			
4 - School of Mathematics and Natural Sciences	PHYGETAV	Foundations of Elementary Particle and Astroparticle Physics	Vorlesung	WiSe	Prof. Dr. Jana Nora Günther, Prof. Dr. Karl-Heinz Kampert, Prof. Dr. Wolfgang Wagner	BA, MA	8	6	
4 - School of Mathematics and Natural Sciences	PHYGETAU	Foundations of Elementary Particle and Astroparticle Physics	Übung	WiSe	Prof. Dr. Jana Nora Günther, Prof. Dr. Karl-Heinz Kampert, Prof. Dr. Wolfgang Wagner	BA, MA			Building on the course lecture on nuclear and particle physics, this course offers students an in-depth study of selected topics in elementary particle and astroparticle physics in preparation for writing their bachelor's thesis.
4 - School of Mathematics and Natural Sciences	CSISMCS2bV	Image Processing and Data Visualization	Vorlesung	WiSe	Prof. Dr. Markus Axer	MA	4	3	Introduction to the importance of modern image processing and data visualization techniques to brain imaging. Data types and structures (scalar, vector, volume data). Transformation and filtering techniques to carve out specific image features. Image processing pipelines in a supercomputing environment. Impact of AI on image processing. Methods for brain data visualization.
4 - School of Mathematics and Natural Sciences	CSISMCS2bU	Image Processing and Data Visualization	Übung	WiSe	Prof. Dr. Markus Axer	MA			
4 - School of Mathematics and Natural Sciences	CSISMCS2bV	Imaging II: Image Processing and Data Visulization	Vorlesung/Übung	WiSe	Prof. Dr. Markus Axer	MA	8	3	The lecture will address the following topics: Modern image processing and data visualization techniques used in brain research Data types and structures (scalar, vector, volume data) Transformation and filtering techniques to carve out specific image features Transformation and filtering techniques to carve out specific image features, Image reconstruction from tomographic measurements, Usage of AI in image processing, Visualization techniques used in brain research
4 - School of Mathematics and Natural Sciences	CSISMIMG2bS	Seminar on Imaging II (Jülich)	Seminar	WiSe	Prof. Dr. Markus Axer	MA		2	Introduction to a selected modeling and simulation framework (lectures, online descriptions). Getting familiar with the code and its application (task-driven). Preparation of oral presentation about experience, method and results.
4 - School of Mathematics and Natural Sciences	CSISMCSim1aU	Introduction to Computer Simulation	Übung	WiSe	Prof. Dr. Francesco Knechtli	MA	2	2	The lecture will address the following topics: Modern image processing and data visualization techniques used in brain research Data types and structures (scalar, vector, volume data) Transformation and filtering techniques to carve out specific image features Transformation and filtering techniques to carve out specific image features, Image reconstruction from tomographic measurements, Usage of AI in image processing, Visualization techniques used in brain research
4 - School of Mathematics and Natural Sciences	CSISMCSim1aV	Introduction to Computer Simulation 1	Vorlesung	WiSe	Prof. Dr. Francesco Knechtli	MA	5	3	
4 - School of Mathematics and Natural Sciences	CSISMCSim3aV	Introduction to Computer Simulation II	Vorlesung	WiSe	Prof. Dr. Jana Nora Günther	MA	4	2	
4 - School of Mathematics and Natural Sciences	CSISMCS1cV	Introduction to High Performance Computing	Vorlesung	WiSe	Dr. Chick Him Wong	MA	3	2	
4 - School of Mathematics and Natural Sciences	PHYEAPV	Introduction to the Atmospheric Physics	Vorlesung	WiSe	Prof. Dr. Ralf Koppmann	MA	8	6	The lecture Introduction to Atmospheric Physics leads to an understanding of the fundamental concepts of atmospheric physics. Students shall be enabled to apply the basic equations including the interaction of physical and chemical processes. With this knowledge they are able to understand basic phenomena of weather and climate.
4 - School of Mathematics and Natural Sciences	PHYMEAVU	Introduction to the Atmospheric Physics	Übung	WiSe	Prof. Dr. Ralf Koppmann	MA			
4 - School of Mathematics and Natural Sciences	CSISMCSim1cV	Lab Course 1	Praktische Übung	WiSe	Dr. Tomasz Korzec, Juan Andres Urrea Nino	MA	2	4	
4 - School of Mathematics and Natural Sciences	CSISMCSim3bV	Lab Course 2	Vorlesung/Übung	WiSe	Dr. Roman Höllwieser, Prof. Dr. Francesco Knechtli	MA	8	4	
4 - School of Mathematics and Natural Sciences	PHYMVTTV	Many Particle Theory	Vorlesung	WiSe	Prof. Dr. Hermann Boos	MA	8	6	The students know advanced phenomena in solid state physics which can not be explained by one particle properties. They are able to describe and compute the interaction of phonons with electrons within the framework of perturbation theory.
4 - School of Mathematics and Natural Sciences	PHYMVTTU	Many Particle Theory	Übung	WiSe	Prof. Dr. Hermann Boos	MA			
4 - School of Mathematics and Natural Sciences	MAT516000	Modern Programming	Vorlesung	WiSe	Dr. Holger Arndt	MA	6	4	

4 - School of Mathematics and Natural Sciences	MAT516001	Modern Programming	Übung	WiSe	Dr. Holger Arndt	MA			the software development cycle (specification, design, implementation, testing, maintenance), object-oriented design (objects, classes, inheritance, UML), C++, Makefiles, debugging, Qt
4 - School of Mathematics and Natural Sciences	MAT032000	Numerical Analysis and Simulation I: ODEs	Vorlesung	WiSe	Dr. Zuzana Buckova, Michelle Christine Muniz, Prof. Dr. Michael Günther	MA	8	6	The students are familiar with complex algorithms for the numerical simulation of ordinary differential equations. They are able to analyze and classify such algorithms, to apply them properly and develop them further.
4 - School of Mathematics and Natural Sciences	MAT032001	Numerical Analysis and Simulation I: ODEs	Übung	WiSe	Dr. Zuzana Buckova, Michelle Christine Muniz, Prof. Dr. Michael Günther	MA			
4 - School of Mathematics and Natural Sciences	MAT037000	Numerical Linear Algebra	Vorlesung	WiSe	Dr. Karsten Kahl	MA	6	3	
4 - School of Mathematics and Natural Sciences	MAT037001	Numerical Linear Algebra	Übung	WiSe	Dr. Karsten Kahl	MA			Numerical Linear Algebra deals with fundamental problems of linear algebra from a numerical, i.e., applied point of view. The course introduces and discusses methods and techniques to solve a wide variety of computational tasks in linear algebra, such as the solution of linear systems of equations, the solution of least-squares problems and the computation of spectral properties of linear operators (e.g., the computation of eigenvalues and eigenvectors). Even though the theoretical foundation of these problems is discussed already in a linear algebra course their efficient solution is oftentimes very intricate. To overcome these difficulties a number of beautiful ideas and algorithms are introduced in this course which are typically not covered in a standard linear algebra course and which provide means to make the powerful concepts of linear algebra applicable in practice. Due to the importance of these topics in applications and their fundamental role in linear algebra, the course not only provides methods and techniques relevant to real world situations, but is also easily accessible with only basic knowledge of linear algebra and numerical analysis.
4 - School of Mathematics and Natural Sciences	PHYMAPST2V	Selected Topics in Atmospheric Physics and Seminar on Atmospheric Physics	Vorlesung	WiSe	Prof. Dr. Claus Michael Volk, Prof. Dr. Ralf Koppman	MA	8	4	
4 - School of Mathematics and Natural Sciences	2020PHYMSTPS	Selected Topics in Atmospheric Physics and Seminar on Atmospheric Physics	Übung	WiSe	Prof. Dr. Claus Michael Volk, Prof. Dr. Ralf Koppman	MA			
4 - School of Mathematics and Natural Sciences	PHYMAPSS1	Selected Topics in Atmospheric Physics and Seminar on Atmospheric Physics	Seminar	WiSe	Prof. Dr. Claus Michael Volk, Prof. Dr. Ralf Koppman	MA			The students are able to work on a selected topic from the fields of atmospheric dynamics and trace trace substance transport and present it in a seminar lecture. They are proficient in information research in the literature and on the internet as well as the preparation of the information for a presentation. You will be able to present the topic dealt with in a way that is suitable for the target group and to design it didactically.
4 - School of Mathematics and Natural Sciences	CHE316150	Theoretical Chemistry Applications	Vorlesung/Übung	WiSe	Prof. Dr. Per Jensen	MA	8	6	
4 - School of Mathematics and Natural Sciences	CSISMCS1bV	Virtualization 1	Vorlesung/Übung	WiSe	Dr. Torsten Harenberg	MA	3	3	
4 - School of Mathematics and Natural Sciences	CHE306170	Organic Supramolecular Chemistry	Vorlesung	WiSe	Guillaume Delaittre	MA		2	
4 - School of Mathematics and Natural Sciences	PHYMSL1V	Superconductivity	Vorlesung	WiSe	Prof. Dr. Christian Heß	MA			1. basic phenomena of superconductivity 2. basic features of the Ginzburg-Landau theory 3. basic features of the BCS theory 4. superconductors in magnetic field 5. josephson effects 6. unconventional superconductors 7. applications of superconductivity
4 - School of Mathematics and Natural Sciences	MAT062100	Multiobjective Optimization	Vorlesung	WiSe	Prof. Dr. Kathrin Klamroth, Dr. Michael Stiglmayr, Prof. Dr. Claudia Totzeck	MA	9	4+2	
4 - School of Mathematics and Natural Sciences	CSISMCS2cV	Virtualization 2	Vorlesung/Übung	WiSe	Dr. Torsten Harenberg	MA	4	3	