UNIVERSITÄT BAYREUTH

INTERNATIONAL OFFICE

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

Available during the Winter Semester 2024/25

An overview for the summer semester 2025 is expected to be available as of 01.04.2025

Mathematics, Physics and Computer Science

Number	Course Title	Duration	Type	ECTS / Credits	Module Description
00083	Review of current scientific literature	2	Le	–	
17480	Classical Density Functional Theory	2	Le & Tu	6; 9; 12; 15	
17481	Classical Density Functional Theory	0,5	Ppc	–	
00464	Current Topics in Complex Systems	2	Se	3	
00642	Small Master's project (Creating Intelligent Interactive Systems)	6	Pj	8	In this practical course, students develop interactive systems that support users in everyday situations by making use of smartphone sensors (e.g. camera, microphone, accelerometer, ...) and Machine Learning to realise "*intelligent*" features. The course starts with an introduction to Android with individual assignments. Later, students work in small teams to develop and implement a prototype app and test it with potential users. The course requires no special prior knowledge apart from solid programming skills. However, students are expected to bring high self-motivation to learn and work at the intersection of Human-Computer-Interaction and applied Machine Learning / AI. Due to the current situation, the course will be held online with weekly meetings via zoom, plus video content and other material. Participation criteria & registration: We use an application-by-email procedure to avoid FCFS. Please send an email to daniel.buschek@uni-bayreuth.de with the subject line "CIIS Master Application Winter 2024/25" and the following information: 1) Your name and student number, 2) a few sentences on why you'd like to take this course, 3) a few sentences on relevant prior knowledge (e.g. other projects or courses that demonstrate your coding skills and motivation for self-directed learning). We'll get in touch via email afterwards.
10104	Introduction to geometry: projective and algebraic geometry	5	Le & Exe	8	This lecture is intended to give a first impression of various areas of geometry, mainly using tools from linear algebra. The basics of projective and affine geometry are covered (e.g. the main theorem of projective geometry, classification and geometric properties of quadrics, the classical theorems of Desargues, Pappos and Pascal), and an insight into the beginnings of algebraic geometry is given. Plane algebraic curves (tangents, singularities, inflection points, Bézout's theorem and linear systems) are dealt with. Essentially, the techniques learned in the beginners' lectures from linear algebra are applied to geometry. No further prior knowledge is required. This lecture is recommended for all students who wish to specialize in a subfield of geometry, as well as for student teachers who will teach geometry at school.
10203	Efficient treatment of non-local operators	6	Le & Tu	8; 10	State-of-the-art linear complexity treatment of partial differential and integral operators and parallelization techniques: - fast multipole methods for the efficient treatment of multi-source potentials (one of the TOP10 algorithms from the 20th century) - hierarchical matrices (for the treatment of non-local operators with linear complexity) - Schwarz methods (additive and multiplicative) - BPX preconditioner - Domain decomposition (overlapping and non-overlapping), BPS and Neumann-Neumann preconditioners, FETI Learning Objectives: - Understanding the way numerical algorithms for the solution of partial differential and integral equations work - Understanding that non-local operators may contain redundancies which can be used to reduce their asymptotic complexity - Ability to choose a suitable algorithm for a given class of partial differential and integral equations - Ability to implement the algorithms discussed in the lecture in a higher programming language on a parallel computer Recommended prior knowledge: Module "Numerical Methods for Differential Equations"
10532	Advanced seminar "Arithmetic Geometry"	2	Se	–	Advanced seminar of the research groups Algorithmic Arithmetic Geometry (Stoll) and Number Theory (Dettweiler).
12205	Data Analysis I	2	Le	8	

Number	Course Title	Duration	Type	ECTS / Credits	Module Description
17465	Polymer physics	4	Le	6; 7; 9; 12; 15	
17466	Polymer physics (supplements)	2	Se	–	
14270	Interdisciplinary Practical Exercise Course Biological Physics	6	Cs	12	
16340	Fundamentals of Crystallography (PBWP4)	4	Le	3; 5	
10304	Efficient Numerical Treatment of Multiscale Problems	6	Le & Tu	4; 8	The course considers a range of modern analytical and numerical approaches for treatment of multi-scale problems in science and engineering. In particular, the following topics will be considered: Analytical approaches - asymptotic analysis - homogenization - Reynolds-averaged Navier-Stokes (RANS), large eddy simulation (LES) Numerical methods - Discontinuous Galerkin (DG) finite element method - multiscale finite element method (MsFEM) - variational multiscale method - wavelet-based discretizations - reduced-basis methods - heterogeneous multiscale methods (HMM) Recommended prior knowledge: Numerical methods for differential equations, programming skills Recommended literature: - Björn Engquist, Per Lötstedt, Olof Runborg, Multiscale Modeling and Simulation in Science, Springer, 2009. - Weinan E, Principles of Multiscale Modeling, Cambridge University Press, 2011. Participation criteria & registration: The course is offered for Master students in Scientific Computing, Technomathematics, Mathematics, Business Mathematics, and Physics. All other interested students please first contact the instructor. The meeting times are only preliminary. Exam mode: oral exam

Key/Abbreviations:

Exe Exercise
Cs Course
Le Lecture
Ppc Propaed.course
Pj Project
Se 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

UNIVERSITÄT BAYREUTH

INTERNATIONAL OFFICE

UNIVERSITÄT BAYREUTH

Contact

University of Bayreuth
International Office
Universitätsstraße 30 | ZUV
95447 Bayreuth

www.international-office.uni-bayreuth.de