Syllabus

Course Description

Course Title	Foundations of Subject-Specific Pedagogy I: Mathematical and Technical Subjects in Upper Secondary Education
Course Code	83020
Course Title Additional	
Scientific-Disciplinary Sector	STAT-04/A
Language	German
Degree Course	University course for initial training of secondary school teachers in the German language - 60CP
Other Degree Courses (Loaned)	
Lecturers	Prof. Dr. rer. nat. habil. Andreas Heinrich Hamel, Andreas.Hamel@unibz.it https://www.unibz.it/en/faculties/economics-management/academic-staff/person/33708
Teaching Assistant	
Semester	All semesters
Course Year/s	1
CP	2
Teaching Hours	12
Lab Hours	0
Individual Study Hours	38
Planned Office Hours	
Contents Summary	The module "Didactics of Mathematics" teaches basic subject-specific didactic skills for the planning, implementation and reflection of lessons in mathematics. The aim is to enable students to professionally design competence-oriented teaching for different learning groups in secondary schools I and II.
Course Topics	In the module, students deal with the basics of mathematics didactics and reflect on the interplay between subject science, curricular requirements and school practice. Building on this, they

	acquire skills in competence-oriented lesson planning by analysing subject-specific competences, formulating learning objectives and planning teaching units in a structured way. Another focus is on the design of suitable learning settings and the methodological implementation. Students learn to use different forms of teaching and methods in a subject-specific way and to design learning processes in an active, differentiated and effective way for learning. Principles of experimental mathematics are appropriately used to design mathematics instruction, beginning with hands-on experiments that lead to mathematical concepts, patterns, and formulas. Topics include: - Fibonacci numbers and Newton methods (derivatives, tangents, recursions to the solution of equations) - Geometric figures and area vs. circumference (irrational and transcendental numbers, trigonometric functions, extreme value problems) - Betting, insurance, risk and uncertainty (probability, expected value, quantiles, decision-making under risk and uncertainty) - Bedford's Law, falsifications and logarithms (data collection, Fibonacci numbers again, probability distributions) - Order relations, rankings and indicators (complete vs. non-complete orders, sports results, grades, HDI, monotony characteristics) - Axioms, deduction and (un)logic (simple axiomatic systems, recursive reasoning, facts vs. fake news, dynamical systems)
Keywords	Subject Didactics Mathematics, experimental Mathematics, design of lessons, educational methods
Recommended Prerequisites	
Propaedeutic Courses	
Teaching Format	Interactive lectures with in-class experiments and discussions.
Mandatory Attendance	According to the degree programme regulations
Specific Educational Objectives and Learning Outcomes	Finally, the module deals with observing, giving feedback and evaluating learning processes and performance in mathematics. Forms of feedback that promote learning as well as criteria for transparent and competence-oriented performance assessment are

	discussed.
Specific Educational Objectives and Learning Outcomes (additional info.)	Knowledge and understanding: understand the experimental approach to teaching mathematics Applying knowledge and understanding: ability to design mathematics lesson starting with hands-on experiments or games and leading to mathematical concepts, structures, formulas. Communications: skill to moderate the cycle "formulate question -> experiment -> pattern/formula -> new question" in class while keeping attention and curiosity of students Learning to learn: skill to transfer the cycle "formulate question -> experiment -> pattern/formula -> new question" to new topics
Assessment	Written exam of 60 minutes
Evaluation Criteria	Correctness of answers, appropriate argumentation.
Required Readings	S. Lerman (editor) Encyclopedia of Mathematics Education, Springer Publishers 2014 (selected topics, material will be provided in class)
Supplementary Readings	T. Leuders (editor), Mathematik-Didaktik, Cornelsen, 6. edition 2011
Further Information	
Sustainable Development Goals (SDGs)	Quality education