interdisciplinary
transformation
university austria

Curriculum

PhD Program

Digital Transformation in Learning

Validity:

The Founding Convention approved the following curriculum on 27.09.2024.

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§ 1 Basis and Applicability:

The legal basis for the PhD program "Digital Transformation in Learning" is the Federal Act on the Institute of Digital Sciences Austria (Interdisciplinary Transformation University) BGBl. I No. 43/2024.

The Founding Convention approved the following curriculum on 27.09.2024.

§ 2 Program Description and Objectives

In an increasingly data-driven world, artificial intelligence is changing when, what and how we learn. The PhD program “Digital Transformation in Learning” empowers PhD students to investigate how intelligent learning technologies enhance and expand active learning in higher education. Applications will transform how we teach and learn, employing technology to offer personalized learning guidance and generating learning content.
Possible topics include individual learning psychology, social dynamics in collaborative and project-based learning, educational considerations in virtual learning scenarios, or the effects of AI on the structure of curricula. These questions require interdisciplinary approaches to find innovative solutions. The combination of subject-specific knowledge and interdisciplinary key competencies prepares students for key roles in a future where digital transformation is integral to our lives.

§ 3 Qualification profile

The IT:U Doctoral School enables young researchers to conduct independent research at a high international level, thereby contributing to technological and societal progress. The students learn to identify and analyze research gaps and societal issues and to find solutions through interdisciplinary approaches. They work on developing and implementing new technologies that drive digital transformation. In addition to subject-specific knowledge, interdisciplinary key competencies are also promoted to prepare students for leadership positions in academia, industry, or the public sector.

§ 4 Duration and Scope

The planned duration of the PhD program “Digital Transformation in Learning” is 4 years. An academic year comprises 60 ECTS credits, with one ECTS credit corresponding to 25 working hours. With 8 semesters, this sums up to 240 ECTS credits in total. The program can be extended as necessary.

§ 5 Admission to the Program

To be admitted to a PhD program at IT:U, candidates must have completed a master's degree in a relevant field of study or another relevant program of at least the same academic level at a recognized domestic or foreign post-secondary educational institution. To compensate for significant differences in subject matter, supplementary examinations may be required, which must be completed by the end of the second semester of the PhD program.

General admission regulations are specified in the respective part of the bylaws.

§ 6 Program Structure

The program conveys content and necessary qualifications through a series of modules. A module is defined by specific entry and exit qualifications, the subject matter, teaching methods, the required workload, and the criteria for performance evaluation. Modules are completed in the form of one or more thematically related courses. There are no additional course types beyond those specified in the bylaws. Figure 1 provides an overview.

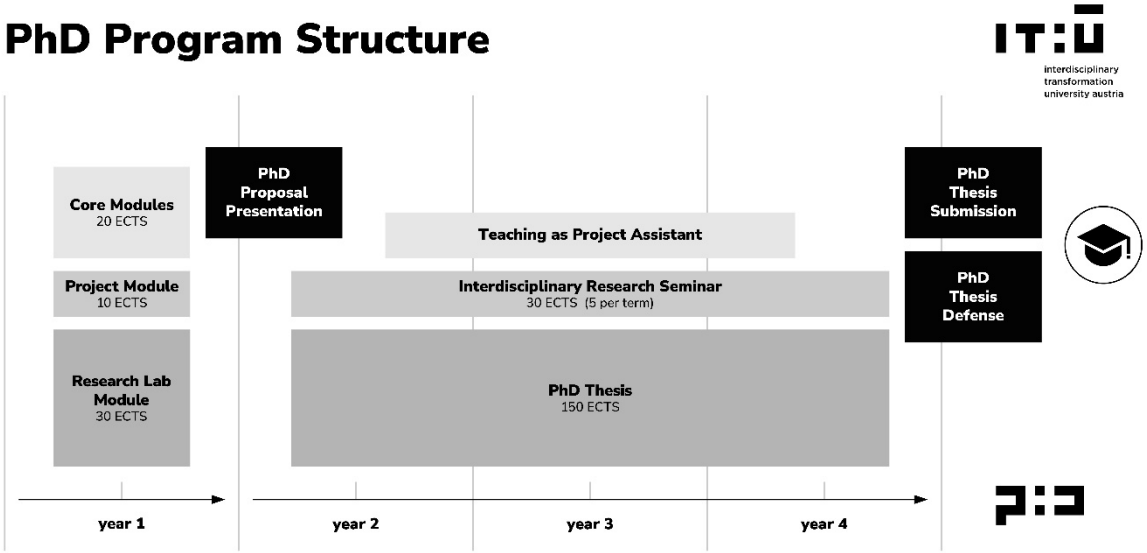

Figure 1: PhD program structure

§ 7 Feasibility of Study and Mobility

The IT:U gives all qualified students, regardless of their personal circumstances, the opportunity to complete their degree within the intended four years. As part of the "feasibility of study“, the workload of the program is defined, the organization of exams regarding dates and deadlines is made transparent, and appropriate advising and support services for students are provided. However, support is limited by the necessity of showing independence and personal responsibility as part of the PhD.

The social dimension of feasibility focuses on enabling students to complete their studies within the standard period, irrespective of gender, age, social and ethnic background, physical and mental disabilities, religion, beliefs, sexual orientation, or other diversity characteristics. The compatibility of studies with personal caregiving responsibilities and/or personal circumstances is ensured through individually tailored support measures.

Mobility opportunities for students are available starting in the second year of study, provided they do not hinder the timely completion of the PhD. The IT:U supports students in organizing these mobility experiences.

§ 8 Thesis

1) A doctoral thesis (dissertation) must be completed as part of the PhD program. It serves to demonstrate the ability to independently address scientific questions. The thesis is a written work and can be composed as a monograph or as a collection of thematically related publications (cumulative dissertation).
2) The thesis must be written under the guidance of a primary supervisor. The primary supervisor must be a faculty member of the Interdisciplinary Transformation University with teaching authorization in the respective area of the dissertation.
3) In addition to the primary supervisor, additional secondary supervisors may be appointed due to interdisciplinarity. They must also hold a habilitation (or equivalent) in a field relevant to the thesis and can be from another domestic or recognized foreign university.
4) A change of supervisor can be requested from the Founding President. In the event of the primary supervisor's absence, a substitute supervisor will be assigned.
5) The thesis topic and the supervisors must be announced by the end of the first year of program, and the PhD proposal must be presented before the program committee. The program committee decides by majority whether the proposal is accepted, and the student can continue their studies.
6) It is recommended that completed parts of the thesis project are published in international journals or conferences.
7) The thesis project must comply with the ethical guidelines of the Interdisciplinary Transformation University and, if necessary, obtain approval from the relevant ethics committee.
8) The completed thesis must be formally submitted and is evaluated by two reviewers, at least one of whom must belong to an external university or research institution. Supervisors cannot act as reviewers for dissertations they have supervised. If the dissertation is positively evaluated by both reviewers, registration for the final oral examination (Rigorosum) can proceed.

§ 9 PhD Thesis Defense (Rigorosum)

1) The PhD Thesis Defense is the final comprehensive examination of the PhD program and serves to confirm the candidate's ability to conduct independent research and defend their thesis.
2) A public defense of the thesis is followed by an oral examination conducted by a thesis committee. The defense includes a presentation of the thesis and a question-and-answer session, where the candidate explains and defends their research to the thesis committee.
3) The Defense can take place once all the requirements specified in the curriculum, including the completed thesis, have been fulfilled.
4) The thesis committee consists of at least three members. One of the members is the primary supervisor, and the other members are usually the reviewers of the dissertation.
5) The Defense is chaired by the chairperson of the thesis committee. The chair is appointed by the Founding President. Virtual participation in the Defense is possible with prior approval from the thesis committee, ensuring all technical requirements for a smooth process are met.
6) The Defense has a maximum duration of 120 minutes and includes a presentation by the candidate followed by a discussion of the presentation content.
7) The evaluation of the Defense is conducted by the thesis committee based on the quality of the presentation and the discussion. The final comprehensive examination is assessed according to the following grading scale:
    1. Passed with distinction: for an outstanding performance.
    2. Passed with merit: for an above-average performance.
    3. Passed: for a satisfactorily passed examination.
    4. Failed: for an inadequate performance.

   The result is to be communicated to the candidate immediately after the examination.

§ 10 Academic Degree and Graduation

Graduates of the PhD program "Digital Transformation in Learning" will be awarded the academic degree "Doctor of Philosophy" – abbreviated "PhD".

§ 11 Effective Date

This curriculum comes into effect on 30.09.2024.

§ 12 Transitional Provisions

No transitional provisions are provided.

§ 13 Appendix 1 – Module Descriptions

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Appendix 1 – Module Descriptions

PhD Program

Digital Transformation in Learning

Module plan

Studies are divided into modules. A module is a self-contained learning unit with content and methods that are thematically and temporally cohesive, delivered through one or more compulsory or elective courses.

Compulsory courses are courses that are a prerequisite for completing a degree. Elective courses are courses from which students can select according to the conditions set out in the curriculum. For an elective course, there is an elective course catalog from which students can make their selection.

PhD program "Digital Transformation in Learning"

term/ ECTS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1st term	M11							Core module: Learning Transformation													M12				Project module: Research Methodology Project					
	Prj. Mgmt. & Prj.-based Learning			Elective A				Elective B				Elective C			Digital Learning Project						Research Methodology		Scient. Writing & Res. Integrity		Elective D		Research Methodology Project			
	2 ECTS	PIC	5 ECTS				PIC	5 ECTS			PIC	2 ECTS	PIC		6 ECTS					PIC	2 ECTS	PIC	2 ECTS	PIC	2 ECTS	PIC	4 ECTS			PRJ
2nd term	M21			Research Lab Immersion 1						M22			Research Lab Immersion 2								M23				Research Lab Immersion 3					
	Research Lab Immersion 1									Research Lab Immersion 2											Research Lab Immersion 3									
	10 ECTS						PRJ			10 ECTS									PRJ		10 ECTS									PRJ
3rd-8th term	MTh			PhD Thesis																						MIRS	Interdisciplinary Research Sem.			
	PhD Thesis																									Interdisciplinary Research Seminar				
	25 ECTS/term 150 ECTS total																									5 ECTS/term 30ECTS		SE		

Within the module **“Learning Transformation”** there are **three elective courses**, Elective course **A**, Elective course **B** and Elective course **C**. Within the module **“Research Methodology Project”** there is **one elective course D**. Students can select the courses they want to choose out of the elective course catalogue. Depending on the students prior knowledge and competences they can choose different student pathways or freely combine the elective courses in agreement with the study program coordinator.

Elective courses

Possible student pathways	Elective A	Elective B	Elective C	Elective D
e.g. Computational pathway Students with no prerequisities in Computation could select	Introduction to Computing 5 ECTS / PIC	Introduction to Data Science and Statistics 5 ECTS / PIC	Introduction to Machine Learn. 2 ECTS / PIC	XR Technologies Fundamentals and Applications 2 ECTS / PIC
e.g. Digital Learning pathway Students with mixed prerequisities in Learning and Computation could select	Introduction to Digital Learning 5 ECTS / PIC	Engaging Learning Technologies 5 ECTS / PIC	Learning Psychology & AI Literacy 2 ECTS / PIC	Innovate and Transform 2 ECTS / PIC
		Eyetracking and Visual Analytics 5 ECTS / PIC	Making and Prototyping 2 ECTS / PIC	Research Ethics 2 ECTS / PIC

Core Module “**Learning Transformation**”	
Abbreviation	LearnTrans
Type	Compulsory module
ECTS points	20
Semester	1
Frequency	Every year
Module exam	No
Prerequisite	None

Compulsory Courses

Course “**Project Management and Project-based Learning**”	
Abbreviation	PM&PBL
Type	Compulsory Course
Course type	PIC
ECTS points	2
Semester	1
Frequency	Every year
Description	This course provides higher education students with an introduction to the fundamental concepts of participating in and managing projects using a project-based learning (PBL) approach. Emphasizing practical experience, the course is designed to prepare students to engage effectively in project-based assignments. Through hands-on activities, case studies, and collaborative projects, students will learn to apply PBL principles to real-world challenges, enhancing their problem-solving, teamwork, and critical thinking skills. The course aims to equip students with the knowledge and skills needed to thrive in project-based environments, both in academic settings and future professional settings.
Learning Outcomes	After successfully completing the course, students will be able to ... • explain the principles and benefits of project-based learning and how it differs from traditional learning

	methods • create project proposals that outline objectives, scope, deliverables, and timelines • work effectively in teams, improving collaboration and communication skills • use basic project management tools and techniques to plan, execute, and monitor projects. • apply project management methodologies (e.g., Agile, Waterfall) in a practical context • identify potential risks and develop mitigation strategies
Content	• Introduction to Project-Based Learning • Team dynamics and collaboration • Project planning and scope management • Project management frameworks (Agile, Waterfall, Hybrid) • Time management and scheduling • Risk management • Project management tools and software
Previous Knowledge	None
Assessment	Courses with continuous assessment

Course "**Digital Learning Project**"

Abbreviation	DigLearnPrj
Type	Compulsory course
Course type	PRJ
ECTS points	6
Semester	1
Frequency	Every year
Description	The course emphasizes practical application of theoretical knowledge, encouraging students to find solutions and execute the project from conception to completion. By collaborating on an interdisciplinary project, students will gain experience in project management, research, and communication.
Learning outcomes	After successfully completing the course, students will be able to ... • apply theoretical knowledge gained in their course work to develop practical solutions to real-world problems • complete a project from the IT:U Learning Projects Catalogue that involves identifying and formulating a

	real-world problem, designing a solution, and implement a prototype • demonstrate the ability to work effectively as part of a team, including distributing tasks, communicating ideas, and managing conflicts • plan, organize, and manage a project
Content	• Formulating the problem and designing solutions • Design thinking principles: empathy, definition, ideation, prototyping, and testing • Project planning and management • Prototyping and implementation • Team dynamics and communication • Project presentation and evaluation • Project reflection
Previous knowledge	None
Assessment	Courses with continuous assessment

Elective Courses A

Course “**Introduction to Computing**”	
Abbreviation	IntroComp
Type	Elective Course
Course type	PIC
ECTS points	5
Semester	1
Frequency	Every year
Description	This course introduces students to the fundamental concepts of computing, including computational thinking and basic programming (data types, control structures, functions, testing, and debugging). Additionally, students will learn about basic algorithms and data structures, as well as the fundamentals of operating systems, computer organization, and web technologies. Through practical programming exercises, students will gain foundational skills and knowledge to understand how computers and networks function, preparing them for further study.
Learning Outcomes	After successfully completing the course, students will be able to

	... • apply computational thinking to solve simple problems. • write and debug basic programs using a programming language. • understand and implement basic algorithms (e.g., sorting, searching) and data structures (e.g., arrays, lists). • understand the functionalities of an operating system and basic architecture of a computer. • apply the basics of web development.
Content	• Problem decomposition, pattern recognition, abstraction, and algorithms. • Introduction to programming languages (Python), basic syntax, variables, conditionals, loops, and functions. • Introduction to common algorithms (e.g., sorting and searching) and data structures (arrays, lists). • Overview of computer hardware components (CPU, memory, I/O devices), and the role of the operating system in managing resources. Practical working with Linux and the Shell. • Basic understanding of the web, HTML, CSS, client-server architecture, and the role of protocols.
Previous Knowledge	None
Assessment	Courses with continuous assessment

Course “**Introduction to Digital Learning**”	
Abbreviation	IntroDigiLearn
Type	Elective Course
Course type	PIC
ECTS points	5
Semester	1
Frequency	Every year
Description	This course introduces the fundamental concepts of how people learn, alongside the role of digital technologies in enhancing the learning process. Grounded in learning psychology—covering cognitive processes like attention, memory, and motivation—students will explore how personalized learning and adaptive technologies, including AI, can create tailored learning experiences. The course also examines key learning theories, such as constructivism, cognitivism, and social learning, and their application in digital learning environments. Additional topics include the use of AI for personalized learning, the effects of

	gamification, and approaches for managing cognitive load and ensuring accessibility in digital education.
Learning Outcomes	After successfully completing the course, students will be able to ... ● explain fundamental concepts of learning psychology, including attention, memory, motivation, and their relevance to digital learning. ● demonstrate an understanding of key learning theories, such as constructivism, cognitivism, and social learning, and apply them in the design of digital learning environments. ● analyze how AI and adaptive technologies can be used to create personalized learning experiences that meet individual learner needs. ● discuss the impact of emerging technologies, such as AI and personalized learning systems, on the future of education and learner engagement. ● critically assess digital tools such as gamification and adaptive systems for their effectiveness in enhancing learning processes.
Content	● Fundamental concepts of learning psychology such as motivation, memory, engagement, and their relevance to digital learning. ● Key learning theories such as constructivism, cognitivism, and social learning. ● The role of the learning theories in digital learning environments. ● Digital technologies in enhancing learning processes, including personalized learning and adaptive technologies. ● Use of AI in creating tailored learning experiences to meet individual learner needs. ● Impact of gamification on learner engagement and motivation in digital education. ● Approaches for managing cognitive load and ensuring accessibility in digital learning. ● Analysis of emerging technologies and their effects on the future of education.
Previous Knowledge	None
Assessment	Courses with continuous assessment

Elective Courses B

Course "**Introduction to Data Science and Statistics**"	
Abbreviation	IntroDS
Type	Elective Course
Course type	PIC
ECTS points	5
Semester	1
Frequency	Every year
Description	This course introduces students to the fundamental steps of the data science process, from data collection and cleaning to analysis, visualization, and interpretation. It provides an overview of core concepts, tools, and techniques used in these steps, including statistical methods, machine learning algorithms, and visualization methods that are essential for research. Emphasis is placed on the application of real-world applications and challenges to provide students with the practical skills required by the project work.
Learning Outcomes	After successfully completing the course, students will be able to ... ● understand Data Science Fundamentals: Explain the data science process, including data collection, cleaning, analysis, visualization, and interpretation. ● understand essential techniques and tools used in these steps (e.g. Python libraries, Jupyter Notebook, R, SPSS) ● understand statistical techniques such as basic descriptive statistics and group comparisons ● understand machine learning methods such as basic supervised and unsupervised methods ● understand how to create meaningful visualizations and communicate findings effectively ● application to real-world data ● recognize ethical considerations and privacy issues associated with data science and the responsible use of data
Content	● Introduction to data science and state-of-the-art tools and environments ● Data collection and data wrangling ● Introduction to data analysis – statistical methods ● Introduction to data analysis – machine learning ● Data visualisation

	• Data ethics and privacy
Previous Knowledge	Programming basics (or alternatively course „Introduction to Computing“)
Assessment	Courses with continuous assessment

Course “**Engaging Learning Technologies**”	
Abbreviation	EngLT
Type	Elective Course
Course type	PIC
ECTS points	5
Semester	1
Frequency	Every year
Description	This course provides an in-depth exploration of digital tools and emerging technologies that transform teaching and learning environments. Students will focus on evaluating and integrating learning management systems, educational apps, and immersive technologies such as virtual and augmented reality. Particular emphasis is placed on the role of generative AI in creating personalized learning experiences and automating educational processes. Participants will critically assess these technologies' effectiveness, challenges, and ethical considerations, developing strategies to enhance learner engagement and educational outcomes.
Learning Outcomes	After successfully completing the course, students will be able to… • evaluate the effectiveness of various digital tools and technologies in enhancing teaching and learning experiences. • analyze the potential of generative AI for personalized learning and automated educational content creation. • critically assess the impact of immersive technologies like VR and AR on learner engagement and educational outcomes. • develop strategies for integrating and aligning digital technologies with educational goals and learning objectives. • identify and address ethical and accessibility considerations in using emerging learning technologies.
Content	• Overview of digital educational tools and technologies (LMS, educational apps).

	• Principles of evaluating educational technologies and their impact. • Role of generative AI in personalized learning and content generation. • Immersive technologies (VR, AR) and their applications in education. • Methods for integrating technology with pedagogical strategies. • Addressing ethical and accessibility issues in digital learning environments. • Trends and innovations in educational technology.
Previous Knowledge	Introduction to Digital Learning
Assessment	Courses with continuous assessment

Course "**Eye-tracking and Visual Analytics**"	
Abbreviation	EyeVA
Type	Elective Course
Course type	PIC
ECTS points	5
Semester	1
Frequency	Every year
Description	This course introduces students to the theoretical foundations and practical applications of eye-tracking technology and visual analytics in virtual environments. The course covers principles of eye-tracking, data collection methods, and integrating eye-tracking data with visual analytics to gain insights into cognitive processes like attention deployment, perception, memory, decision-making, and cognitive load. Students will explore how these technologies can be used to assess and enhance the effectiveness of digital learning tools, instructional design, and user interface adaptation.
Learning Outcomes	After successfully completing the course, students will be able to… • understand the principles of eye-tracking technology and its applications in human-computer interaction. • design and conduct eye-tracking studies to investigate user behaviour and cognitive processes in digital environments and develop intelligent and adaptive user interfaces.

	• collect, preprocess, and analyse eye-tracking data using state-of-the-art visual analytics tools. • interpret and visualise eye-tracking data to derive actionable insights for improving user experience and learning outcomes. • develop new adaptive user interfaces to improve the exploration and understanding of complex datasets. • critically assess eye-tracking technology's ethical considerations and limitations in research and educational settings.
Content	• Introduction to eye-tracking technology and its applications in educational research. • Data collection methods and experimental setup. • Preprocessing and analysis of eye-tracking data. • Fundamentals of visual analytics. • Development of visual analytics tools supported by eye-tracking for data exploration and understanding. • Utilising eye-tracking data to adapt the user interface according to the user attention • Designing and conducting eye-tracking studies in virtual environments. • Interpreting eye-tracking data for insights into user behaviour and cognitive processes. • Ethical considerations in using eye-tracking technology.
Previous Knowledge	None
Assessment	Courses with continuous assessment

Elective Courses C

Course “**Introduction to Machine Learning**”	
Abbreviation	IntroML2
Type	Elective Course
Course type	PIC
ECTS points	2
Semester	1
Frequency	Every year
Description	This course introduces the fundamental principles and techniques of machine learning. Students will explore key concepts such as supervised and unsupervised learning, data preprocessing, and model evaluation. The course covers essential algorithms, including linear regression and decision trees. By the end of the course, students will have a solid foundation to apply machine learning techniques to real-world problems across various domains.
Learning Outcomes	After successfully completing the course, students will be able to ... ● understand the basic machine learning concepts and types, including supervised, unsupervised, and reinforcement learning. ● preprocess data effectively, including handling missing data, normalization, and feature engineering. ● implement and evaluate core machine learning algorithms such as linear regression and decision trees. ● use popular machine learning libraries to develop and deploy models. ● recognize and address ethical issues in machine learning, such as algorithmic bias and fairness.
Content	● Fundamentals of machine learning: key concepts, definitions, and types (supervised, unsupervised, reinforcement learning). ● Overview of data preprocessing: handling missing data, normalization, and feature engineering. ● Core machine learning algorithms: linear regression, decision. ● Use of popular machine learning libraries and tools. ● Ethical considerations in machine learning: bias, fairness, and interpretability.

Previous Knowledge	Programming basics (or alternatively course „Introduction to Computing“)
Assessment	Courses with continuous assessment

Course “**Making and Prototyping**”	
Abbreviation	MakePro
Type	Elective Course
Course type	PIC
ECTS points	2
Semester	1
Frequency	Every year
Description	This course is a hands-on, project-based learning experience designed to engage students in making and fabrication. This course empowers students to explore, design, and create using a variety of tools and technologies while working on a project that progressively builds their expertise in different aspects of making.
Learning Outcomes	After successfully completing the course, students will be able to ... ● use safely and effectively a variety of tools and equipment commonly found in a Maker’s lab, such as a 3D printer, laser cutter, CNC machines, soldering irons, and tools to quickly prototype ideas ● understand the different materials and their properties, selecting appropriated materials for their prototypes ● understand the fundamentals of electronics and circuitry ● use digital tools to design and virtually prototype simple mechanical and electrical systems ● build and test simple electronics prototypes
Content	● Overview of making and fabrication ● Safety protocols for working in a maker's lab ● Introduction to tools and equipment ● Material properties and selection ● Fundamentals of electronics and circuitry ● Digital design and virtual prototyping e.g. CAD ● Prototyping
Previous Knowledge	None
Assessment	Courses with continuous assessment

Course “**Learning Psychology and AI Literacy**”	
Abbreviation	LearnPsyAI
Type	Elective Course
Course type	PIC
ECTS points	2
Semester	1
Frequency	Every year
Description	This course explores the intersection of learning psychology and artificial intelligence (AI) to understand how AI can be leveraged to support and enhance learning processes. Students will gain insights into key psychological theories such as self-regulated learning, motivation, and communication models and how they are applied in AI-driven educational tools. The course will also address the potential risks associated with over-reliance on AI, including skill atrophy and dependency while discussing strategies for promoting critical thinking and preserving essential human skills. Participants will critically evaluate the benefits and challenges of AI in education, fostering a comprehensive understanding of how AI can be integrated into learning environments to support personalized learning, tutoring, and student engagement.
Learning Outcomes	After successfully completing the course, students will be able to… ● understand and apply key psychological theories such as self-regulated learning, motivation, and communication in the context of AI-driven education. ● evaluate the potential of AI tools in creating personalized learning experiences and supporting self-regulated learning strategies. ● analyze the role of AI as a tutor or mentor and its impact on student engagement and achievement. ● critically assess the risks of over-reliance on AI in learning, including skill atrophy and loss of critical thinking abilities. ● develop strategies to integrate AI effectively into educational settings while maintaining a balance between human and machine-supported learning.
Content	● Introduction to learning psychology: self-regulated learning, motivation, and communication models. ● Applications of AI in education: adaptive learning, AI tutors, and personalized learning paths. ● Role of AI in enhancing student motivation and engagement.

	• Evaluating the impact of AI on learning processes and outcomes. • Risks and challenges of AI dependency in education: skill atrophy and cognitive decline. • Strategies for effective integration of AI in learning environments. • Ethical considerations and future directions in AI-driven education.
Previous Knowledge	Introduction to Digital Learning
Assessment	Courses with continuous assessment

Project Module **"Research Methodology Project"**

Abbreviation	ResMethProj
Type	Compulsory module
ECTS points	10
Semester	1
Frequency	Every year
Module exam	No
Prerequisite	None

Compulsory courses

Course "**Research Methodology**"

Abbreviation	ResMethods
Type	Compulsory Course
Course type	PIC
ECTS points	2
Semester	1
Frequency	Every year
Description	This course provides a practical introduction to the methods and techniques of academic research. Students will learn about research design, data collection, analysis, and interpretation. Through a real-world project, students will apply theoretical knowledge to develop research questions, conduct literature reviews, and implement research methods. The course emphasizes critical thinking, analytical skills, and collaboration, equipping students with the tools and experience necessary to conduct effective and ethical research in an interdisciplinary context.
Learning Outcomes	After successfully completing the course, students will be able to ... ● understand and critically assess different research designs and apply them in interdisciplinary research projects. ● set up a study and formulate research questions and hypotheses. ● review, analyze, and compare scientific literature. ● create effective research plans, including methodology,

	sampling techniques, and data collection methods. • choose and employ appropriate tools, data collection and analysis techniques, and interpret results to draw meaningful conclusions. • understand and apply ethical principles in research, including issues related to consent, confidentiality, and data integrity.
Content	• Foundations of scientific research: Definition, objectives, motivation, and the language of research • Problem identification and formulation of research questions and hypotheses • Research design • Literature search and review • Data types and data collection methods • Quantitative and qualitative methods and data analysis • Interpreting and presenting results • Ethical considerations in research • Use of tools for research
Previous Knowledge	Basic programming skills preferred but not mandatory
Assessment	Courses with continuous assessment

Course “**Scientific Writing and Research Integrity**”	
Abbreviation	SciWriResInt
Type	Compulsory Course
Course type	PIC
ECTS points	2
Semester	1
Frequency	Every year
Description	This course introduces students to the fundamentals of scientific writing and addresses research integrity issues. Students will learn how to effectively communicate scientific ideas, research findings, and data through clear, structured writing. By engaging in a writing project such as research papers, lab reports, and literature reviews, students will apply key principles of scientific writing, including clarity, precision, and proper citation practices. The course emphasizes the development of critical thinking and analytical skills, equipping students with the tools needed to produce high-quality scientific documents.

Learning Outcomes	After successfully completing the course, students will be able to ... • understand and apply the conventions of scientific writing, including structure, style, and tone appropriate for academic and research contexts. • construct well-organized and logically coherent scientific arguments based on evidence and research. • develop skills in revising and editing scientific documents to improve clarity, accuracy, and overall quality.
Content	• Discussion and application of scientific writing in the context of communicating research procedures and results in PhD-theses and papers • Structuring scientific documents • Collaborative writing projects and peer review • Critical thinking and logical argumentation • Scientific integrity and research ethics
Previous Knowledge	None
Assessment	Courses with continuous assessment

Course “**Research Methodology Project**”	
Abbreviation	ResMethPrj
Type	Compulsory Course
Course type	PRJ
ECTS points	4
Semester	1
Frequency	Every year
Description	The course emphasizes practical application of theoretical knowledge, encouraging students to find solutions and execute the project from conception to completion. By collaborating on an interdisciplinary project, students will gain experience in project management, research, and communication.
Learning Outcomes	After successfully completing the course, students will be able to ... • apply theoretical knowledge gained in their course work to develop practical solutions to real-world problems • complete a project from the IT:U Learning Projects Catalogue that involves identifying and formulating a real-world problem, designing a solution, and implement a

	prototype • demonstrate the ability to work effectively as part of a team, including distributing tasks, communicating ideas, and managing conflicts • plan, organize, and manage a project
Content	• Formulating the problem and designing solutions • Design thinking principles: empathy, definition, ideation, prototyping, and testing • Project planning and management • Prototyping and implementation • Team dynamics and communication • Project presentation and evaluation • Project reflection
Previous Knowledge	Basic programming skills preferred but not mandatory
Assessment	Courses with continuous assessment

Elective Courses D	
Course “**XR Technologies Fundamentals and Applications**”	
Abbreviation	XRFundApp
Type	Elective Course
Course type	PIC
ECTS points	2
Semester	1
Frequency	Every year
Description	This course provides an in-depth exploration of Extended Reality (XR) technologies, including Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR), with a focus on their practical applications across various domains such as education, healthcare, and industry. Students will learn about the fundamentals of XR, biosensors, and their integration into immersive and collaborative environments. The course will equip students with the skills to design and implement XR projects, with an emphasis on enhancing communication, collaboration and on accommodating diverse user needs. Through hands-on projects

	and research, students will develop the expertise to create inclusive and effective XR experiences.
Learning Outcomes	After successfully completing the course, students will be able to ... ● understand XR technologies: Gain a comprehensive understanding of VR, AR, and MR technologies, including their hardware and software components, as well as its benefits and limitations. ● learn about biosensors and their role in enhancing XR experiences, particularly in analysing and adapting to users' sensory needs. ● evaluate XR Applications: Research and evaluate the benefits of XR technologies and biosensor data across various domains, such as education, healthcare, and industry. ● enhance communication: Analyse how XR technologies can enhance communication and collaboration through immersive experiences, supporting diverse user needs, e.g., accessibility. ● design and implement XR projects: Develop skills to design and implement XR projects focused on virtual meetings, collaborative environments, and communication on specific topics. ● gain basic skills to conduct research on the application of XR in various fields and develop innovative solutions to real-world problems.
Content	● Introduction to XR Technologies: ○ Overview of VR, AR, and MR ○ Hardware and software components ○ Current trends, limitations and future directions ● Biosensors in XR: ○ Types of biosensors (e.g., eye-tracking, ECG) ○ Integration of biosensors with XR technologies ○ Monitoring and adapting to sensory needs ● Evaluating XR Applications: ○ Benefits of XR in education, healthcare, industry ○ Case studies and practical applications ○ Addressing specific needs and challenges in each domain ● Enhancing Communication with XR: ○ Immersive experiences and their impact on communication and collaboration ○ Supporting diverse user styles ○ Accessibility and Ethics in XR ● Designing and Implementing XR Projects: ○ Principles and Guidelines of XR project design and storytelling ○ User-centred design methodologies ○ Prototyping and testing XR environments ● Research Methods and Project Development: ○ Research methodologies in XR

	○ Developing and conducting experiments ○ Analysing and presenting research findings ● Hands-On Project: ○ Designing an XR experience for a collaborative environment ○ Implementing biosensors in XR environments ○ Focusing on real-world application to improve communication and teamwork
Previous Knowledge	Basic programming skills preferred but not mandatory
Assessment	Courses with continuous assessment

Course "**Research Ethics**"	
Abbreviation	ResEth
Type	Elective Course
Course type	PIC
ECTS points	2
Semester	1
Frequency	Every year
Description	This course focuses on the ethical dimensions of research in the context of digital transformation. It introduces students to key ethical theories, principles, and dilemmas that arise in research, particularly in digital environments. Topics include privacy, data integrity, intellectual property, and the ethical challenges of AI, machine learning and XR. Students will explore real-world case studies, engage in debates, and apply ethical frameworks to their own research. The course emphasizes critical ethical reasoning, responsible decision-making, and the integration of ethical considerations throughout the research process.
Learning Outcomes	After successfully completing the course, students will be able to ... ● understand the foundational ethical principles that govern research and apply them to digital transformation contexts. ● identify and analyze ethical issues related to privacy, consent, and confidentiality in digital research. ● critically evaluate ethical dilemmas in the use of digital tools and technologies, including artificial intelligence, machine learning and XR. ● apply ethical frameworks to the design and

	implementation of research studies, ensuring adherence to ethical standards. • navigate intellectual property rights and issues of authorship in the digital age. • implement data integrity and security practices to ensure the ethical management of research data. • understand and apply ethical principles in interdisciplinary and international research collaborations.
Content	• Foundations of research ethics: Key theories, principles, and dilemmas • Privacy, consent, and confidentiality in digital research • Ethical challenges in AI, machine learning, and XR • Data integrity, security, and management • Intellectual property, plagiarism, and authorship • Ethical considerations in interdisciplinary research • International and cultural dimensions of research ethics • Case studies: Ethical failures and successes in digital research • Practical tools and frameworks for ethical decision-making in research
Previous Knowledge	None
Assessment	Courses with continuous assessment

Course “**Innovate and Transform**”	
Abbreviation	InnovTrans
Type	Elective Course
Course type	PIC
ECTS points	2
Semester	1
Frequency	Every year
Description	This course offers an engaging introduction to digital transformation through a hands-on project. Students will explore how emerging technologies and digital strategies reshape industries and organizations through several use cases. By working on a practical project, they will apply concepts such as data analysis and change management to a real-world scenario. The course emphasizes critical thinking, problem-solving, and teamwork as students develop interdisciplinary solutions to digital transformation challenges.

Learning Outcomes	After successfully completing the course, students will be able to ... ● name and understand key digital technologies and their impact on business and industry ● create and implement strategies for integrating digital tools and technologies into organizational processes ● learn and apply change management principles to facilitate successful digital transformation initiatives ● ework effectively in teams to develop and present digital transformation solutions for real-world problems ● assess the effectiveness of digital solutions and reflect on their impact on organizational performance and innovation
Content	● Introduction to digital transformation (concepts and definitions, impact) ● Key digital technologies and their applications ● Digital strategy development ● Change management principles ● Assessing effectiveness and impact
Previous Knowledge	None
Assessment	Courses with continuous assessment

Research Lab Module **"Research Lab Immersion 1"**	
Abbreviation	RLab1
Type	Compulsory module
ECTS points	10
Semester	2
Frequency	Every year
Module exam	No
Prerequisite	None

Course: "**Research Lab Immersion 1"**	
Abbreviation	RLab 1
Type	Compulsory course
Course type	PRJ
ECTS points	10
Semester	2
Frequency	Every year
Description	This course provides students with the opportunity to develop and execute a research project that explores interdisciplinary work within a specific research area. By immersing themselves in diverse research environments, students will gain hands-on experience with various research methodologies and approaches from multiple fields. The course is designed to foster a deeper understanding of how interdisciplinary research can address complex problems and to enhance students' ability to integrate knowledge and techniques from different disciplines into their own projects.
Learning outcomes	After successfully completing the course, students will be able to ... • formulate and develop a research project that integrates methodologies and concepts from multiple disciplines • utilize and adapt various research methodologies from different fields to address complex problems • demonstrate the ability to select and apply appropriate research techniques based on the interdisciplinary nature of the project

	• synthesize knowledge and techniques from multiple disciplines to enhance a research project
Content	Defined accordingly with research project
Previous knowledge	None
Assessment	Courses with continuous assessment

Research Lab Module **"Research Lab Immersion 2"**

Abbreviation	RLab2
Type	Compulsory Module
ECTS points	10
Semester	2
Frequency	Every year
Module exam	No
Prerequisite	None

Course **"Research Lab Immersion 2"**

Abbreviation	RLab 2
Type	Compulsory course
Course type	PRJ
ECTS points	10
Semester	2
Frequency	Every year
Description	This course provides students with the opportunity to develop and execute a research project that explores interdisciplinary work within a specific research area. By immersing themselves in diverse research environments, students will gain hands-on experience with various research methodologies and approaches from multiple fields. The course is designed to foster a deeper understanding of how interdisciplinary research can address complex problems and to enhance students' ability to integrate knowledge and techniques from different disciplines into their own projects.
Learning outcomes	After successfully completing the course, students will be able to ...

	• formulate and develop a research project that integrates methodologies and concepts from multiple disciplines • utilize and adapt various research methodologies from different fields to address complex problems • demonstrate the ability to select and apply appropriate research techniques based on the interdisciplinary nature of the project • synthesize knowledge and techniques from multiple disciplines to enhance a research project
Content	Content is determined accordingly with the project.
Previous knowledge	None
Assessment	Courses with continuous assessment

Research Lab Module **"Research Lab Immersion 3"**

Abbreviation	RLab3
Type	Compulsory module
ECTS points	10
Semester	2
Frequency	Every year
Module exam	No
Prerequisite	None

Course **"Research Lab Immersion 3"**

Abbreviation	PRJ RLab 3
Type	Compulsory course
Course type	PRJ
ECTS points	10
Semester	2
Frequency	Every year
Description	This course provides students with the opportunity to develop and execute a research project that explores interdisciplinary work within a specific research area.

	By immersing themselves in diverse research environments, students will gain hands-on experience with various research methodologies and approaches from multiple fields. The course is designed to foster a deeper understanding of how interdisciplinary research can address complex problems and to enhance students' ability to integrate knowledge and techniques from different disciplines into their own projects.
Learning outcomes	After successfully completing the course, students will be able to ... • formulate and develop a research project that integrates methodologies and concepts from multiple disciplines • utilize and adapt various research methodologies from different fields to address complex problems • demonstrate the ability to select and apply appropriate research techniques based on the interdisciplinary nature of the project • synthesize knowledge and techniques from multiple disciplines to enhance a research project
Content	Content is determined accordingly with the project.
Previous knowledge	None
Assessment	Courses with continuous assessment

Module **”Interdisciplinar Research Seminar”**

Abbreviation	IntdResSem
Type	Compulsory module
ECTS points	5
Semester	3 - 8
Frequency	Every semester
Module exam	No
Prerequisite	None

Course **“Interdisciplinar Research Seminar Series”**

Abbreviation	IntdResSem
Type	Compulsory course

Course type	SEM
ECTS points	5
Semester	3 – 8
Frequency	Every semester
Description	This course is designed to support PhD students through the entire process of developing their dissertations, with a focus on interdisciplinary research. Over the span of six semesters, students will engage in a series of workshops, seminars, and collaborative projects that explore the theories, methodologies, and practical challenges of conducting research across disciplinary boundaries. The course emphasizes the integration of diverse perspectives, fostering innovation, and addressing complex research questions that require interdisciplinary approaches.
Learning outcomes	After successfully completing the course, students will be able to ... • understand and discuss the importance of interdisciplinary research in addressing complex societal and academic challenges • demonstrate the ability to apply interdisciplinary approaches to their PhD thesis, including the identification of appropriate research questions and hypotheses • effectively communicate and collaborate with peers and faculty from various disciplines to enrich their research • identify and overcome common barriers to interdisciplinary research, such as differing terminologies, research methods, and evaluation criteria
Content	• Introduction to interdisciplinary research concepts and planning • Developing and refining interdisciplinary research strategies • Advanced interdisciplinary research techniques and collaboration • Synthesis, presentation, and reflection on interdisciplinary research
Previous knowledge	None
Assessment	Courses with continuous assessment

Module **"PhD Thesis"**	
Abbreviation	PhD Thesis
Type	Compulsory module
ECTS points	150
Semester	3-8
Frequency	Every semester
Module exam	No
Prerequisite	Accepted PhD proposal

Course **"PhD Thesis"**	
Abbreviation	PhD Thesis
Type	Compulsory course
Course type	
ECTS points	150
Semester	3-8
Frequency	Every semester
Description	Within the context of this course the students will develop their thesis involving processes like identifying a research question or hypothesis, conducting in-depth research, and systematically organizing the findings into a coherent and well-supported argument. It culminates in the creation of a thesis document that presents original contributions to knowledge within a specific field of study.
Learning outcomes	After successfully completing the course, students will be able to ... • formulate clear and feasible research questions or hypotheses for their PhD thesis • design a detailed research plan, including methodology, data collection, and analysis strategies, that aligns with their research objectives • identify, evaluate, and synthesize relevant literature to establish a strong theoretical foundation for their research • critically assess existing research to identify gaps that their thesis will address • apply appropriate research methodologies and techniques to collect and analyse data • adapt and refine their research approach based on ongoing findings and feedback from peers and faculty

	• develop a clear and coherent structure for their dissertation • participate in peer review sessions, offering and receiving constructive feedback to enhance the quality of their research • incorporate feedback from supervisors, peers, and other faculty members to refine their thesis • articulate and defend their research findings in both written and oral formats • develop presentation skills and strategies for effectively communicating complex research to academic and non-academic audiences
Content	
Previous knowledge	None
Assessment	PhD thesis examination and thesis defence

PhD program "Digital Transformation in Learning"

term/ ECTS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1st term	**M11**	**Core module: Learning Transformation**																			**M12**	**Project module: Research Methodology Project**								
	Prj. Mgmt. & Prj.-based Learning		Elective A					Elective B					Elective C		Digital Learning Project						Research Methodology		Scient. Writing & Res. Integrity		Elective D		Research Methodology Project			
	2 ECTS	PIC	5 ECTS				PIC	5 ECTS				PIC	2 ECTS	PIC	6 ECTS					PIC	2 ECTS	PIC	2 ECTS	PIC	2 ECTS	PIC	4 ECTS			PRJ
2nd term	**M21**	**Research Lab Immersion 1**									**M22**	**Research Lab Immersion 2**									**M23**	**Research Lab Immersion 3**								
	Research Lab Immersion 1										Research Lab Immersion 2										Research Lab Immersion 3									
	10 ECTS									PRJ	10 ECTS									PRJ	10 ECTS									PRJ
3rd-8th term	**MTh**	**PhD Thesis**																								**MIRS**	**Interdisciplinary Research Sem.**			
	PhD Thesis																									Interdisciplinary Research Seminar				
	25 ECTS/term 150 ECTS total																									5 ECTS/term 30ECTS			SE	

PhD program "Digital Transformation in Learning"

Module	Course	Course type	ECTS
Core module: Learning Transformation			
	Project Management and Project-based Learning	PIC	2
	Elective A	PIC	5
	Elective B	PIC	5
	Elective C	PIC	2
	Digital Learning Project	PRJ	6
			20
Project Module "Research Methodology Project"			
	Research Methodology	PIC	2
	Scientific Writing and Research Integrity	PIC	2
	Elective D	PIC	2
	Research Methodology Project	PRJ	4
			10
Research Lab Module "Research Lab Immersion 1"			
	Research Lab Immersion 1	PRJ	**10**
Research Lab Module "Research Lab Immersion 2"			
	Research Lab Immersion 2	PRJ	**10**
Research Lab Module "Research Lab Immersion 3"			
	Research Lab Immersion 3	PRJ	**10**
Module "Interdisciplinar Research Seminar"			
	Interdisciplinar Research Seminar Series (6*5 ECTS)	SEM	**30**
Module "PhD Thesis"			
	PhD Thesis Development	PRJ	**150**
			240

Elective A			
Computational pathway	Introduction to Computing	PIC	5
Digital Learning pathway	Introduction to Educational Psychology	PIC	5
Elective B			
Computational pathway	Introduction to Data Science and Statistics	PIC	5
Digital Learning pathway	Engaging Learning Technologies	PIC	5
	Eyetracking and Visual Analytics	PIC	5
Elective C			
Computational pathway	Introduction to Machine Learning	PIC	2
Digital Learning pathway	Learning Psychology and AI Literacy	PIC	2
	Making and Prototyping	PIC	2
Elective D			
free - no pathway	XR Technologies Fundamentals and Applications	PIC	2
free - no pathway	Innovate and Transform	PIC	2
free - no pathway	Research Ethics	PIC	2