Technische Universität Nürnberg

M.Sc. / M.A.
“Human and Artificial Intelligence”

Module Handbook

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Learning Outcomes

Goal 1:

- To provide students with approaches to human cognition and artificial intelligence from the fields of Computer Science, Psychology, and Philosophy.
- To provide students with integrated methods from Philosophy, Psychology, and Computer Science in order to resolve multifaceted problems in the field of responsible AI.

Objective 1.1: Students are able to identify, describe, and classify different approaches to human intelligence and artificial intelligence, understand their synergies and differences, and apply these insights to contemporary challenges in opinion-forming and knowledge-gaining processes.

Objective 1.2: Students are able to indicate and discuss applications and opportunities for Artificial Intelligence and outline specific human abilities in recognition and reasoning.

Objective 1.3: Students are able to predict and describe results of AI-applications based on knowledge and understanding of AI core concepts.

Objective 1.4: Students are able to understand or apply AI technologies and develop criteria and methods for anticipating the ethical, psychological, and societal implications of these applications.

Goal 2:

- To provide students with practice-oriented projects in collaboration with local employers.
- To equip students with the skills to raise public awareness regarding the application areas of AI processes and to strengthen the understanding of the possibilities and limitations of AI applications in organizations, communities, society, and industry.

Objective 2.1: Students are able to use their broad understanding of human cognition in order to and improve human-computer-interactions and to identify novel areas of applying AI.

Objective 2.2: Students are able to facilitate decision making-processes through the implementation of AI methods.

Objective 2.3: Students are able to engage in dialogue concerning AI methods across diverse domains and to develop responsible AI tailored to human problem-solving.

Objective 2.4: Students are able to engineer and analyze AI applications for fairness and collaborate with Data Engineers to avoid biases and safeguard privacy.

Objective 2.5: Students are able to generate ideas for advancing AI technologies and implement them in their professional environments (e.g., organizations, communities, industry, etc.).

Goal 3:

- To provide students with techniques to work effectively in diverse teams and continuously develop their own expertise and learning.
- To provide students with methods to tackle unexplored challenges and develop an innovative problem-solving attitude.

Objective 3.1: Students are able to use adaptive expertise, apply creative thinking and lifelong learning.

Objective 3.2: Students are able to reflect on technology, leadership and knowledge of ethics and relate them to current and future socio-technical contexts.

Objective 3.3.: Students are able to follow the standards of scientific work and effectively integrate AI applications into their own research, information retrieval, and knowledge construction.

Objective 3.4: Students are able to cultivate an innovative mindset, effective problem solving, and critical thinking, particularly in entrepreneurial contexts.

Objective 3.5: Students are able to collaborate effectively in international teams, fostering an appreciation for diversity within their personal environment.

Goal 4:

- To provide students with practice, ideas of sustainability and democratic citizenship.
- To provide students to reflect on and relate their own actions to social and ethical contexts.

Objective 4.1: Students are able to enhance the transparency of AI protocols and ensure democratic participation in determining AI applications.

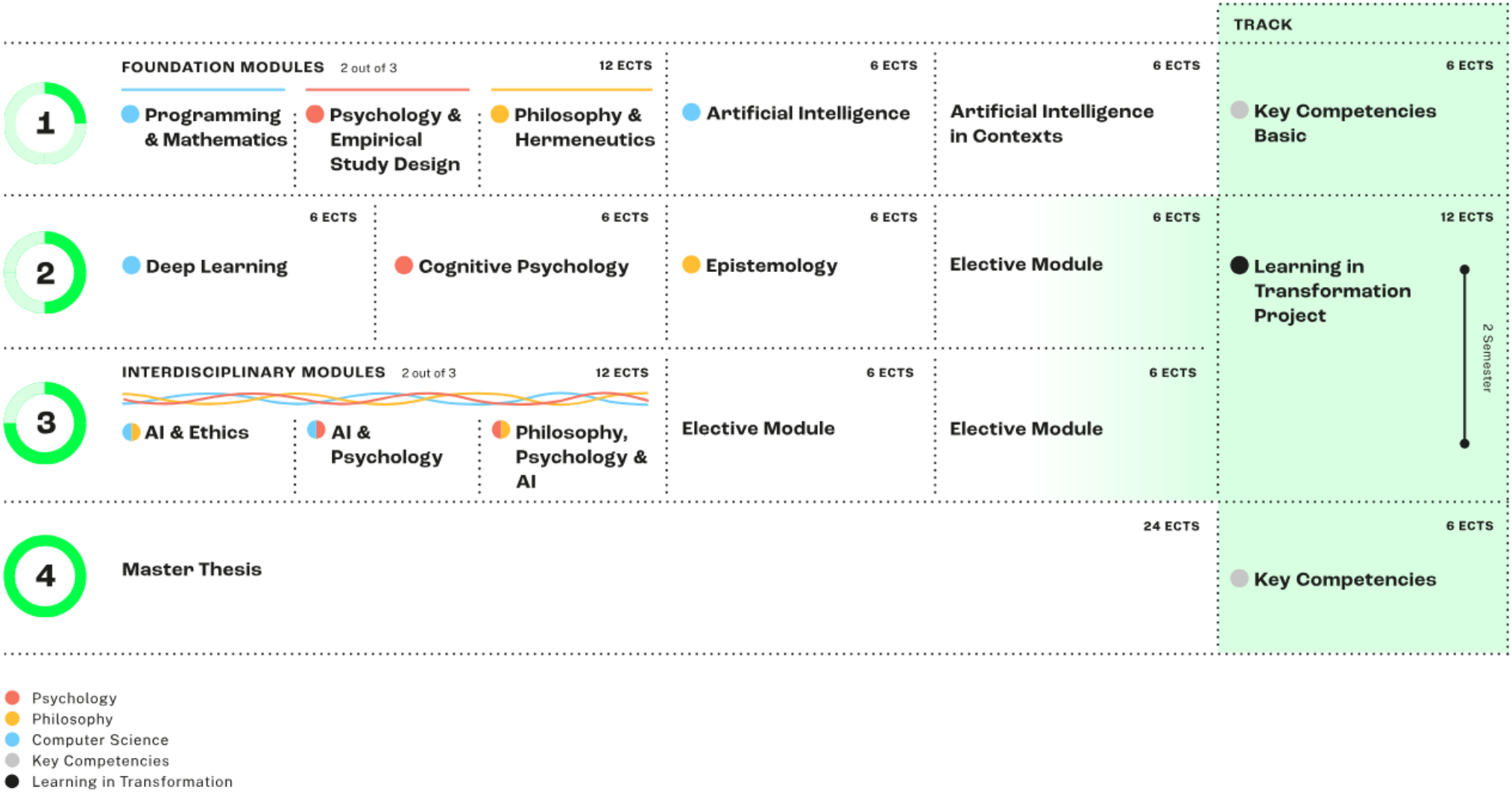
Objective 4.2: Students are able to discuss responsible AI technologies with a wider public and implement in organizations for mastering challenges especially related to the transformation towards a sustainable and fair society.

Objective 4.3: Students are able to understand the functioning of human opinion-forming and decision-making processes in different communities and societies, embrace democratic values, and act accordingly.

Modules Overview

Sem.	Module	ECTS-Punkte	Associated courses
1	Artificial Intelligence in Contexts Module	6	Artificial Intelligence in Contexts
1	Artificial Intelligence Module	6	Artificial Intelligence
Foundation Modules: 12 ECTS points according to notice of admission			
1	Foundations in Programming & Mathematics Module	6	Foundations in Programming & Mathematics
1	Foundations in Psychology & Empirical Study Design Module	6	Foundations in Psychology & Empirical Study Design
1	Foundations in Philosophy & Hermeneutics Module	6	Foundations in Philosophy & Hermeneutics
1	Elective Module 4	6	All elective courses
1	Key Competencies Basic Module	6	Good Scientific Practice Democratic Citizenship Resilience
2	Deep Learning Module	6	Deep Learning
2	Cognitive Psychology Module	6	Cognitive Psychology
2	Epistemology Module	6	Epistemology
2+3	Learning in Transformation Module	12	Learning in Transformation Project
Interdisciplinary Modules: 12 ECTS points			
3	AI & Ethics Module	6	AI & Ethics
3	AI & Psychology Module	6	AI & Psychology
3	Philosophy, Psychology & AI Module	6	Philosophy, Psychology & AI
2-3	Elective Module 1	6	All elective courses
2-3	Elective Module 2	6	All elective courses
2-3	Elective Module 3	6	All elective courses
4	Key Competencies Module 1	6	Choose from KC Pool
4	Master Thesis	24	Master Thesis and Colloquium

Semester Overview



Details of Modules

Artificial Intelligence in Contexts Module			**6 ECTS**
Recommended Semester	**1st semester**	**Total Workload**	**180 hours**

Module No.	2M-HAI-AIC
Duration	One semester
Course frequency	Winter semester
Module language	English
Admission requirements	None
Associated courses	Artificial Intelligence in Contexts
Instructor	Prof. Dr. Gyburg Uhlmann/Theoretical Philosophy; NN; NN
Examination	Learning-oriented assignments
Grading	Graded
Program related Learning outcomes (see pp. 3-4)	Students are able to ● Identify and describe various interdisciplinary approaches to AI, integrating perspectives from Computer Science, Psychology, Philosophy, and Human-Computer Interaction (1.1) ● Describe and evaluate different historical and contemporary concepts of human and artificial intelligence (1.2) ● Analyze the context and implications of AI applications in various domains (1.4) ● Apply knowledge of AI law and regulations to ensure compliance and promote responsible AI development (2.4) ● Assess the ethical and societal impacts and challenges of AI technologies (2.4)
Additional specific module related learning outcomes	Students are able to ● Understand and explain the fundamental principles of AI law and regulations
Contents	● Interdisciplinary approaches to AI ● Contextual analysis of AI applications ● Legal frameworks governing AI ● Ethical and societal impacts of AI ● Case studies on AI regulations and compliance
Teaching and learning formats	See syllabus
Related programs	M. Sc. / M. A. Human and Artificial Intelligence

Artificial Intelligence Module			**6 ECTS**
Recommended Semester	**1st semester**	**Total Workload**	**180 hours**

Module No.	1M-HAI-AIM
Duration	one semester
Course frequency	Winter semester
Module language	English
Admission requirements	None
Associated courses	Artificial Intelligence
Instructor	N.N. (CSAI)
Examination	Learning-oriented assignments
Grading	Graded
Program related Learning outcomes (see pp. 3-4)	Students are able to ● Understand basic concepts in AI, including reasoning, searching, planning, and optimal control (1.1) ● Dissect and analyze the weaknesses and strengths of the non-parametric AI techniques compared to data-driven learning paradigms (1.3) ● Implement the AI methods and apply them to real-world problems (2.2)
Contents	● Introduction to Artificial Intelligence ● Basic AI concepts such as reasoning, searching, and planning ● Non-parametric AI techniques ● Data-driven learning paradigms
Teaching and learning formats	See syllabus
Related programs	M. Sc. / M. A. Human and Artificial Intelligence

Foundations in Programming & Mathematics Module			**6 ECTS**
Recommended Semester	**1st semester**	**Total Workload**	**180 hours**

Module No.	1M-HAI-FPM
Duration	One semester
Course frequency	Winter semester
Module language	English
Admission requirements	None
Associated courses	Foundations in Programming & Mathematics
Instructor	Prof. Dr. Christoph Hertrich, Prof. Dr. Johannes Thürauf
Examination	Learning-oriented assignments
Grading	Graded
Program related Learning outcomes (see pp. 3-4)	Students are able to ● Understand basic concepts of mathematics relevant to AI (1.1) ● Critically evaluate the use of mathematical and programming methods in the context of AI (1.3)
Additional specific module related learning outcomes	Students are able to ● Develop basic skills in programming languages commonly used in AI ● Apply algorithmic concepts and implementation skills to solve simple programming problems
Contents	● Basics of Linear Algebra (systems of linear equations, matrices, vectors, norms, inner products) ● Basics of Multivariate Analysis (partial differentiation, gradients) ● Basics of Optimization (global vs. local optima, gradient descent) ● Basic notions of Probability and Statistics ● Basics of Python programming (variables, conditions, loops, functions, ● recursion) ● Basic data structures (arrays, lists, dictionaries, etc.) ● Basic algorithms (sorting, search, ...)
Teaching and learning formats	See syllabus
Related programs	M. Sc. / M. A. Human and Artificial Intelligence

Foundations in Psychology & Empirical Study Design Module			**6 ECTS**
Recommended Semester	**1st semester**	**Total Workload**	**180 hours**

Module No.	2M-HAI-FPE
Duration	One semester
Course frequency	Winter semester
Module language	English
Admission requirements	None
Associated courses	Foundations in Psychology & Empirical Study Design
Instructor	N.N. (Experimental Psychology Professor)
Examination	Learning-oriented assignments
Grading	Graded
Program related Learning outcomes (see pp. 3-4)	Students are able to ● Explain key psychological theories and concepts relevant to AI and HCI. (1.1) ● Apply psychological insights to improve human-computer interaction. (2.1) ● Apply principles of good scientific practice in psychology (3.3)
Additional specific module related learning outcomes	Students are able to ● Design and conduct empirical studies to investigate human cognition and behavior. ● Analyze empirical data using appropriate statistical methods. ● Summarize and report empirical data in a concise manner.
Contents	● Introduction to psychology ● Cognitive psychology ● Human behavior and cognition ● Empirical study design ● Data collection and analysis
Teaching and learning formats	See syllabus
Related programs	M. Sc. / M. A. Human and Artificial Intelligence

Foundations in Philosophy & Hermeneutics Module			**6 ECTS**
Recommended Semester	**1st semester**	**Total Workload**	**180 hours**

Module No.	2M-HAI-FPH
Duration	One semester
Course frequency	Winter semester
Module language	English
Admission requirements	None
Associated courses	Foundations in Philosophy & Hermeneutics
Instructor	Prof. Dr. Gyburg Uhlmann / History of Philosophy Professor
Examination	Learning-oriented assignments
Grading	Graded
Program related Learning outcomes (see pp. 3-4)	Students are able to ● Understand and critically evaluate major philosophical approaches to human cognition throughout history. (1.1) ● Develop arguments regarding the nature of human understanding (3.1) ● Integrate philosophical insights into their broader academic and professional pursuits (3.2) ● Apply principles of good scientific practice in philosophy (3.3)
Additional specific module related learning outcomes	Students are able to ● Apply hermeneutic methods to interpret and analyze philosophical texts from different historical periods.
Contents	● Introduction to philosophy and its relevance to human cognition. ● Historical overview of major philosophical theories of human understanding and cognition, from ancient to modern times. ● Hermeneutic methods for interpreting philosophical and historical texts. ● Ethical and societal implications of human cognition throughout history. ● Foundational texts and debates in philosophy, including works by Plato, Aristotle, Descartes, Kant, and contemporary philosophers.
Teaching and learning formats	See syllabus
Related programs	M. Sc. / M. A. Human and Artificial Intelligence

Deep Learning Module			**6 ECTS**
Recommended Semester	**2nd semester**	**Total Workload**	**180 hours**

Module No.	2M-HAI-DLM
Duration	One semester
Course frequency	Summer semester
Module language	English
Admission requirements	None
Associated courses	Deep Learning
Instructor	Prof. Dr. Josif Grabocka
Examination	Learning-oriented assignments
Grading	Graded
Program related Learning outcomes (see pp. 3-4)	Students are able to ● Explain core concepts and techniques in deep learning. (1.1) ● Train neural networks following both predictive and generative objectives (2.4) ● Apply deep learning methods to solve real-world problems. (1.2) ● Understand the ethical implications of deep learning. (1.4; 2.3)
Additional specific module related learning outcomes	Students are able to ● Evaluate the performance of deep networks using statistical methods.
Contents	● Introduction to artificial intelligence and machine learning ● Supervised and unsupervised learning ● Neural networks and deep learning ● Model evaluation and validation
Teaching and learning formats	See syllabus
Related programs	M. Sc. / M. A. Human and Artificial Intelligence

Cognitive Psychology Module			**6 ECTS**
Recommended Semester	**2nd semester**	**Total Workload**	**180 hours**

Module No.	2M-HAI-COP
Duration	One semester
Course frequency	Summer semester
Module language	English
Admission requirements	None
Associated courses	Cognitive Psychology
Instructor	N.N. (Cognitive Psychology Professor)
Examination	Learning-oriented assignments
Grading	Graded
Program related Learning outcomes (see pp. 3-4)	Students are able to ● Understand major theories and models of human intelligence and cognition. (1.1) ● Describe the cognitive processes involved in perception, learning and memory, and decision-making. (2.2) ● Design and conduct empirical studies to investigate cognitive processes. (3.3)
Additional specific module related learning outcomes	Students are able to ● Read and critically evaluate empirical studies on human cognition.
Contents	● Theories and models of human intelligence ● Cognitive processes: perception, memory, attention, and decision-making ● Experimental methods in cognitive psychology ● Cognitive biases and their impact on human behavior
Teaching and learning formats	See syllabus
Related programs	M. Sc. / M. A. Human and Artificial Intelligence

Epistemology Module			**6 ECTS**
Recommended Semester	**2nd semester**	**Total Workload**	**180 hours**

Module No.	2M-HAI-EPI
Duration	One semester
Course frequency	Summer semester
Module language	English
Admission requirements	None
Associated courses	Epistemology
Instructor	N.N. (Theoretical Philosophy Professor)
Examination	Learning-oriented assignments
Grading	Graded
Program related Learning outcomes (see pp. 3-4)	Students are able to ● Critically assess and produce philosophical arguments (2.3; 3.2) ● Understand and apply central epistemological concepts including knowledge, belief and justification (1.1) ● Assess the limitations of human knowledge (1.2) ● Assess the extent to which AI is capable of sharing knowledge, justification and belief (1.4)
Additional specific module related learning outcomes	Students are able to ● Distinguish and assess different sources of knowledge including perception, inference and testimony ● Understand and apply norms regulating belief formation
Contents	● The nature of belief, justification and knowledge ● Sources of knowledge ● The norms of belief and belief formation ● Arguments for and against skepticism ● The relationship between human cognition and AI
Teaching and learning formats	See syllabus
Related programs	M. Sc. / M. A. Human and Artificial Intelligence

AI & Ethics Module			**6 ECTS**
Recommended Semester	**3rd semester**	**Total Workload**	**180 hours**

Module No.	2M-HAI-AIE
Duration	One semester
Course frequency	Winter semester
Module language	English
Admission requirements	None
Associated courses	AI & Ethics
Instructor	Prof. Dr. Gyburg Uhlmann/Theoretical Philosophy Professor and Prof. Dr. Josif Grabocka
Examination	Learning-oriented assignments
Grading	Graded
Program related Learning outcomes (see pp. 3-4)	Students are able to ● Understand the principles of trustworthy and explainable AI. (1.1; 1.4) ● Analyze ethical issues related to the development and deployment of AI systems. (2.3) ● Develop explainable AI models that prioritize transparency and accountability. (2.4; 4.1) ● Apply philosophical frameworks to evaluate the ethical implications of AI technologies. (4.2)
Contents	● Principles of trustworthy and explainable AI ● Methods for enhancing transparency in AI systems ● Ethical frameworks for evaluating AI technologies ● Case studies on the ethical implications of AI ● Techniques for building explainable AI models ● Interdisciplinary approaches to AI ethics
Teaching and learning formats	See syllabus
Related programs	M. Sc. / M. A. Human and Artificial Intelligence

AI & Psychology Module			**6 ECTS**
Recommended Semester	**3rd semester**	**Total Workload**	**180 hours**

Module No.	2M-HAI-AIP
Duration	One semester
Course frequency	Winter semester
Module language	English
Admission requirements	None
Associated courses	AI & Psychology
Instructor	N.N. and N.N. (Human-Computer-Interaction Professor and N.N.)
Examination	Learning-oriented assignments
Grading	Graded
Program related Learning outcomes (see pp. 3-4)	Students are able to ● Understand the key principles of human-computer interaction (HCI). (1.1) ● Design AI systems that enhance user experience and usability. (2.1) ● Apply psychological theories to evaluate and improve human-AI interactions. (2.5) ● Integrate human factors into the development of AI applications. (4.3)
Additional specific module related learning outcomes	Students are able to ● Conduct empirical studies to assess and improve the effectiveness of AI interfaces.
Contents	● Principles of human-computer interaction ● User-centered design methodologies ● Psychological aspects of HCI ● Evaluation methods for AI interfaces ● Designing intuitive and accessible AI systems ● Case studies in human-AI interaction
Teaching and learning formats	See syllabus
Related programs	M. Sc. / M. A. Human and Artificial Intelligence

Philosophy, Psychology & AI Module			**6 ECTS**
Recommended Semester	**3rd semester**	**Total Workload**	**180 hours**

Module No.	2M-HAI-PPA
Duration	One semester
Course frequency	Winter semester
Module language	English
Admission requirements	None
Associated courses	Philosophy, Psychology & AI
Instructor	N.N. and N.N. (Cognitive Psychology Professor and Theoretical Philosophy Professor)
Examination	Learning-oriented assignments
Grading	Graded
Program related Learning outcomes (see pp. 3-4)	Students are able to ● Understand the psychological impact of AI on individuals and communities. (4.3) ● Analyze the role of AI as a tool for societal change. (4.2) ● Evaluate the philosophical implications of AI's integration into society. (3.2) ● Discuss the ethical and societal challenges posed by AI technologies. (1.4) ● Propose interdisciplinary solutions to enhance the societal benefits of AI. (2.1; 2.5) ● Assess the differences and similarities between human and artificial intelligence (1.2)
Contents	● The concept of AI as an organon (tool) in society ● Psychological effects of AI on human behavior and social dynamics ● Philosophical perspectives on the role of technology in society ● Ethical challenges of AI in public and private sectors ● Case studies on AI's impact on societal issues ● Interdisciplinary approaches to addressing AI-related societal challenges ● Concepts of human and artificial intelligence
Teaching and learning formats	See syllabus
Related programs	M. Sc. / M. A. Human and Artificial Intelligence

Elective Module 1			**6 ECTS**
Recommended Semester	**2nd or 3rd semester**	**Total Workload**	**180 hours**

Module No.	2M-HAI-EL1
Duration	One semester
Course frequency	Winter or Summer semester
Module language	English
Admission requirements	None
Associated courses	One course must be selected from all interdisciplinary or advanced courses and must be approved by the academic mentor.
Instructor	Depends on selected course
Examination	See syllabus (varies by course)
Grading	Graded
Program related Learning outcomes (see pp. 3-4)	Students are able to ● Focus on a specialized disciplinary or interdisciplinary research area; (1.1) ● Demonstrate comprehensive knowledge of their chosen area; (1.1) ● Critically evaluate literature and propose new research questions; (2.1) ● Reflect on their learning and recognize connections; (3.1) ● Raise new research questions in preparation for their Master's thesis. (2.5)
Contents	See syllabus (varies by course)
Teaching and learning formats	See syllabus
Related programs	M. Sc. / M. A. Human and Artificial Intelligence

Elective Module 2			**6 ECTS**
Recommended Semester	**2nd or 3rd semester**	**Total Workload**	**180 hours**

Module No.	2M-HAI-EL2
Duration	One semester
Course frequency	Winter or Summer semester
Module language	English
Admission requirements	None
Associated courses	One course must be selected from all interdisciplinary or advanced courses and must be approved by the academic mentor.
Instructor	Depends on selected course
Examination	See syllabus
Grading	Graded
Program related Learning outcomes (see pp. 3-4)	Students are able to ● Focus on a specialized disciplinary or interdisciplinary research area; (1.1) ● Demonstrate comprehensive knowledge of their chosen area; (1.1) ● Critically evaluate literature and propose new research questions; (2.1) ● Reflect on their learning and recognize connections; (3.1) ● Raise new research questions in preparation for their Master's thesis. (2.5)
Contents	See syllabus
Teaching and learning formats	See syllabus
Related programs	M. Sc. / M. A. Human and Artificial Intelligence

Elective Module 3			**6 ECTS**
Recommended Semester	**2nd or 3rd semester**	**Total Workload**	**180 hours**

Module No.	2M-HAI-EL3
Duration	One semester
Course frequency	Winter or Summer semester
Module language	English
Admission requirements	None
Associated courses	One course must be selected from all interdisciplinary or advanced courses and must be approved by the academic mentor.
Instructor	Depends on selected course
Examination	See syllabus
Grading	Graded
Program related Learning outcomes (see pp. 3-4)	Students are able to ● Focus on a specialized disciplinary or interdisciplinary research area; (1.1) ● Demonstrate comprehensive knowledge of their chosen area; (1.1) ● Critically evaluate literature and propose new research questions; (2.1) ● Reflect on their learning and recognize connections; (3.1) ● Raise new research questions in preparation for their Master's thesis. (2.5)
Contents	See syllabus (varies by course)
Teaching and learning formats	See syllabus
Related programs	M. Sc. / M. A. Human and Artificial Intelligence

Elective Module 4			**6 ECTS**
Recommended Semester	**1st semester**	**Total Workload**	**180 Workload**

Module No.	2M-HAI-EL4
Duration	One semester
Course frequency	Winter or Summer semester
Module language	English
Admission requirements	None
Associated courses	One course must be selected from all interdisciplinary or advanced courses and must be approved by the academic mentor.
Instructor	Depends on selected course
Examination	See syllabus
Grading	Graded
Program related Learning outcomes (see pp. 3-4)	Students are able to ● Focus on a specialized disciplinary or interdisciplinary research area; (1.1) ● Demonstrate comprehensive knowledge of their chosen area; (1.1) ● Critically evaluate literature and propose new research questions; (2.1) ● Reflect on their learning and recognize connections; (3.1) ● Raise new research questions in preparation for their Master's thesis. (2.5)
Contents	See syllabus (varies by course)
Teaching and learning formats	See syllabus
Related programs	M. Sc. / M. A. Human and Artificial Intelligence

Key Competencies Basic Module			**6 ECTS**
Recommended Semester	**1st semester**	**Total Workload**	**180 hours**

Module No.	8M-KCO-KCB
Duration	One semester
Course frequency	Winter semester
Module language	English
Admission requirements	None
Associated courses	Good Scientific Practice Democratic Citizenship Resilience All three courses have to be completed
Instructor	Depending on course
Examination	Learning-oriented assignments
Grading	Pass/Fail
Program related Learning outcomes (see pp. 3-4)	Students are able to ● Understand basic principles of good scientific practice. (3.3) ● Identify different forms and situations of scientific misconduct and apply strategies to avoid them. (3.3) ● Demonstrate values of a democratic society as well as sustainable environment and act accordingly. (4.1) ● Reflect on technology leadership and knowledge of ethics and relate them to current and future socio-technical contexts. (3.2; 4.3) ● Understand different techniques to cope with stress and adverse working conditions. (3.5) ● Act effectively in global and personal challenges and continuously develop their own expertise and learning. (3.5)
Contents	Good Scientific Practice Students learn the rules and values of responsible and ethical research. This includes handling data, sources, and ideas of others, citation rules, forms of scientific misconduct and how to avoid them, and research ethics. Democratic Citizenship Students acquire knowledge about principles of vivid democracies and civic rights and responsibilities and foster the respect for diversity. They know how to engage actively and responsibly in democratic processes and civic life and learn how to responsibly use their specialized knowledge and be aware of unintended consequences of their actions.

	Resilience Students acquire techniques to cope with stress and manage diverse challenges with resilience in a productive way. They will use methods for effectively analyzing problems and generating creative solutions to overcome obstacles. Furthermore, students learn strategies for setting realistic goals and maintaining motivation to achieve them, even in face of adversity.
Teaching and learning formats	Courses are offered in weekly sessions or as block courses during the course-free period. The syllabus specifies the course content.
Related programs	M.Sc. AI & Robotics, M.Sc. Human and Artificial Intelligence

Key Competencies Module 1			**6 ECTS**
Recommended Semester	**4th semester**	**Total Workload**	**180 hours**

Module No.	8M-KCO-KC1
Duration	One semester
Course frequency	Summer semester
Module language	English
Admission requirements	None
Associated courses	Students select KQ courses that provide a total of 6 ECTS points (usually 2-3 courses) per module. A total of 6 ECTS points must be earned from the available KQ courses.
Instructor	Depends on selected course
Examination	See syllabus (varies by course)
Grading	Pass/Fail
Program related Learning outcomes (see pp. 3-4)	Students are able to ● Apply key techniques and methodologies needed to work in an academic and professional environment; (3.4) ● Communicate effectively in foreign languages; (3.5) ● Reflect on and extend their knowledge independently. (3.1)
Contents	Students develop academic and professional key competencies. Students select two or three courses from the key competencies course offerings. The syllabus outlines the specific course content.
Teaching and learning formats	Courses are offered in weekly sessions or as block courses during the course-free period. The syllabus outlines specific course information.
Related programs	M. Sc. / M. A. Human and Artificial Intelligence

Learning in Transformation Module			**12 ECTS**
Recommended Semester	**2nd and 3rd semester**	**Total Workload**	**360 hours**

Module No.	2M-HAI-LIT
Duration	Two semesters
Course frequency	Summer semester
Module language	English
Admission requirements	None
Associated courses	Transformative Learning Project
Instructor	1-2 professor(s) from any department who can supervise the projects and coaches/teaching assistants
Examination	Project, scientific paper, or presentation
Grading	Pass/Fail
Program related Learning outcomes (see pp. 3-4)	Students are able to ● Identify steps to solving a real-world research problem and design an action plan to implement these steps; (2.5; 3.3; 3.4) ● Develop and test a working prototype; (2.5) ● Critically evaluate and provide feedback on solution approaches from other student groups; (4.2) ● Explain and present the solution approach to the stakeholder(s) and peers; (4.2) ● Assess/evaluate the outcome of the project and defend the development steps. (4.2)
Contents	The Learning in Transformation Project is an interdisciplinary scientific research project that focuses on practical learning experiences. It aims to provide students with a scientific-based approach to solve real-world problem with industrial, societal, or political problems working with non-university stakeholders. The project encourages students to creatively apply their prior knowledge to solve these problems in groups. For further information see the syllabus.
Teaching and learning formats	The module combines learning units, discussion and supervision sessions, field trips, and a high proportion of independent work within student groups (guided by an instructor). Over the course of two semesters, milestones help structuring the project planning and assure that the group is on track and on time. Students document the project and learning progress. For further information see the syllabus.
Related programs	M. Sc. / M. A. Human and Artificial Intelligence

Master Thesis Module			**24 ECTS**
Recommended Semester	**4th semester**	**Total Workload**	**720 hours**

Module No.	2M-HAI-THE
Duration	One semester
Course frequency	Winter and summer semester
Module language	English
Admission requirements	None
Associated courses	Master Colloquium
Instructor	Student select the thesis advisor
Examination	Thesis and oral exam
Grading	Graded
Program related Learning outcomes (see pp. 3-4)	Students are able to ● Formulate a research question in AI and robotics, select the appropriate methodology and literature, and design an evaluation strategy; (1.1) ● Use scientific methods to propose an innovative solution to a complex problem; (3.3) ● Critically analyze and evaluate theories and approaches and reflect on their assumptions and limitations in an interdisciplinary context; (2.1) ● Integrate knowledge from different domains to create novel solutions to the research problem; (2.4) ● Independently plan a research project within a given time frame; (3.4) ● Apply the rules of good scientific practice to all parts of the research project; and (3.3) ● Structure and communicate research results in accordance with academic standards. (4.2)
Contents	The students select their research topics in coordination with their advisor. The students present their work during a research colloquium that takes place during the term/semester.
Teaching and learning formats	Independent research and colloquium See syllabus
Related programs	M. Sc. / M. A. Human and Artificial Intelligence