"Intellectics: The Science of AI (M.A.)

(1) The aim of the research-oriented and fully English-language degree program "Intellectics: The Science of AI M.A." is to provide students with a deep understanding of the fundamentals, approaches, methods and results in the science of artificial intelligence (AI) on the basis of the humanistic educational principle, as well as to promote a broad scientific understanding of the interaction of humans with systems that can perform non-trivial tasks for humans from different perspectives. Approaches are pursued that arise, for example, from relevant questions in the humanities, especially philosophy, and contribute to the solution of these questions.

(2) The science of AI is an interdisciplinary field of research that uses approaches and findings from various humanities and structural sciences (in addition to engineering and natural sciences) and implements and further develops them from an information technology perspective. The paradigm of a rational agent (also known as an agentic system), i.e. the paradigm of an actor acting in a dynamic environment, which independently develops a plan to achieve an internal goal under limited time and memory resources depending on its observations and its internally formed model, is central to the mediation of information technology abstraction and modeling. The internal goal can be developed by the agent from a context and a task description, which can originate from a human or another agent, but can also be developed proactively as a contribution to an overall system. The fulfillment of an agent's internal goals through rational action, taking into account the available resource constraints (storage space, computing time), defines the concept of intelligence used in intellect as a science: In this sense, agents can act intelligently by fulfilling the non-trivial tasks assigned to them to the satisfaction of the people involved (as task setters) without an algorithm being directly specified for this purpose. In a system consisting of (several) agents and humans, the interaction of humans and agents in a so-called (social) mechanism poses additional challenges due to the fact that several actors with possibly different local goals act in an environment, whereby the respective local goals may be incompatible with each other or with a global goal of the mechanism. If such a system reliably achieves a global goal, it is commonly referred to as an intelligent system or AI system for short.

(3) In addition to a critical-analytical examination of intelligent agents, students also acquire the necessary theoretical and practical skills to develop new safe, trustworthy, robust, transparent and explainable agents themselves and to learn to evaluate a wide range of possibilities as well as potential dangers by reflecting on social mechanisms and ethical issues. These core competencies are covered by three pillars in the degree program (see the table of subject-specific compulsory modules below), whereby the first pillar comprises general data and

algorithmic competence, the second pillar comprises modeling competence (especially for planning) in an agent and the third pillar comprises modeling for the design of multi-agent systems and social mechanisms.

(4) Professionally, this not only opens up the option for students to pursue an academic career with a doctorate in the interdisciplinary field of AI, e.g. with computer science, philosophy, mathematics, sociology, economics, etc., but also the option of working in an advisory capacity, e.g. in companies, commissions or non-profit organizations for all AI-relevant topics. The declared aim of the degree program in terms of sustainable teaching is not only to help students to successfully apply for jobs in the areas mentioned, but also to ensure quality and stability in professional life (job security) by teaching the essential ideas, concepts, methods and approaches in a sustainable way - in contrast to focusing on currently popular technologies, programming languages or similar.

Study program Intellectics: The Science of AI M.A. **Subject-specific modules in the compulsory area**		
Modules		
Int11 Understanding Data vs. Machine Training (8 CP / 4 SWS) Lecture (3 CP, 2 SWS) Seminar (3 CP, 2 SWS) Module examination in the seminar (2 CP)	**Int12 GenAI in Education, Science, and Society (8 CP / 4 SWS)** Lecture (3 CP, 2 SWS) Seminar (3 CP, 2 SWS) Module examination in the seminar (2 CP)	**Int13 Agents, Intellectics, and Logic (8 CP / 4 SWS)** Lecture (3 CP, 2 SWS) Seminar (3 CP, 2 SWS) Module examination in the seminar (2 CP)
Int21 Perception: Natural Language Processing and Computer Vision (8 CP / 4 SWS) Lecture (3 CP, 2 SWS) Seminar (3 CP, 2 SWS) Module examination in the seminar (2 CP)	**Int22 Planning and Decision Processes (8 CP / 4 SWS)** Lecture (3 CP, 2 SWS) Seminar (3 CP, 2 SWS) Module examination in the seminar (2 CP)	**Int23 Uncertainty, Causality, and (8 CP / 4 SWS)** Lecture (3 CP, 2 SWS) Seminar (3 CP, 2 SWS) Module examination in the seminar (2 CP)
Int31 Human-Compatible (8 CP / 4 SWS) Lecture (3 CP, 2 SWS) Seminar (3 CP, 2 SWS) Module examination in the seminar (2 CP)	**Int32 Probabilistic Foundation Models (8 CP / 4 SWS)** Lecture (3 CP, 2 SWS) Seminar (3 CP, 2 SWS) Module examination in the seminar (2 CP)	**Int33 Social Mechanisms, Social Epistemology, and Formal Ethics (8 CP / 4 SWS)** Lecture (3 CP, 2 SWS) Seminar (3 CP, 2 SWS) Module examination in the seminar (2 CP)

Study program Intellectics: The Science of AI M.A. Interdisciplinary elective area
Interdisciplinary elective area (18 LP) Courses from the subject areas of Philosophy, Computer Science or Language, Literature, Media I/II.

Degree program Intellectics: The Science of AI M.A. Final module
Final module (30 LP) Master's thesis (25 LP) Lecture with oral examination (5 CP)

II Module descriptions

Module type	**Compulsory module in the degree Intellectics: The Science of AI M.A.**
Title	**Understanding Data vs. Machine Training**
Module sigle	**Int11**
Qualification goals	Students have skills in all topics listed in the bullet points under content in the area of data analysis and machine learning. In particular, students will be able to (i) name the central ideas, (ii) define the relevant terms, (iii) explain how the associated methods and approaches work, (iv) critically reflect on and assess the possibilities, limitations, risks and effects of using these methods and approaches, and (v) apply the methods and approaches to solve typical problems in the modeling and design of systems. Students should acquire skills in the use of the Python programming language and be able to use them to gain an understanding of data processing processes, in particular for the machine training of functions, so that a technically sound evaluation of the performance of current techniques is possible. Competencies in the area of analysis are acquired in the context of direct application in the area of content-related topics.
Contents	• Classification vs. regression, parametric and non-parametric supervised learning, regularization to avoid overfitting, minimum description length • Accumulation analysis, shopping basket analysis, recommendations • Statistical basics: Samples, optimal estimators, distribution, density, cumulative distribution, scales: Nominal, ordinal, interval and ratio scales, hypothesis tests, confidence intervals • Computational meshes from differentiable parameterized elementary units, learning of mesh parameters with gradient descent, back propagation, deep learning: embedding spaces and autoencoders, unsupervised learning • Stochastic and probabilistic basics: probabilities, random variables, conditional probabilities, independence, distributions, Bayesian networks for the specification of distributions by factorization, blackboard notation, queries, query answering algorithms, learning methods for complete data, regularization from a probabilistic point of view • Inductive learning: version space, concept of entropy, decision trees, learning rules • Ensemble methods: Bagging (Random Forests), Boosting (XGBoost) • Clustering: K-Means, DBSCAN, analysis of variation (ANOVA), t-test, linear discriminant analysis • Prediction by evaluating time series (ARIMA, Auto-Regressive Integrated Moving Average) Practical part of the seminar

	• Programming language Python with associated libraries from the field of data science (NumPy, SciPy, Pandas, matplotlib, NLTK) as well as basics of databases • Machine learning with Python (scikit-learn) • Deep Learning with Python (PyTorch) • Tools for scientific work: Markup languages (LaTeX, Markdown), version management (git), development environments
Teaching methods	Lecture: 2 SWS Seminar: 2 SWS
Language of instruction	English
Prerequisites for participation	None
Applicability of the module	Intellectics: The Science of AI M.A.
Module completion	Prerequisite for registering for the module examination: Regular participation in the seminar in accordance with the provisions of Section 5 (3). Coursework to be completed (oral presentations, practicals, reports, etc.) will be announced in detail at the beginning of the course. Type of examination: Written term paper (12-15 pages, maximum processing time: 3 months) on training experiments carried out and presentations on the results of training experiments as part of the seminar. Language of the module examination: English
Workload in the individual module parts	Lecture: 3 LP Seminar: 3 LP Term paper: 2 LP
Total workload of the module	8 LP
Frequency of the offer	Annually in the winter semester
Duration	1 semester
Recommended semester	1st semester

Module type	**Compulsory module in the degree** **Intellectics: The Science of AI M.A.**
Title	**GenAI in Education, Science, and Society**
Module sigle	**Int12**
Qualification goals	Students have skills in all the topics listed in the bullet points under content in the field of generative artificial intelligence and its impact on education, science and society. In particular, students will be able to (i) name the central ideas, (ii) define the relevant terms, (iii) explain how the associated methods and approaches work, (iv) critically reflect on and assess the possibilities, limitations, risks and effects of using these methods and approaches, and (v) apply the methods and approaches to solve typical problems in the modeling and design of systems. Students will be able to discuss implications for education as well as for the education system, science and society in a well-founded manner with a professional background. Competencies in the area of linear algebra are acquired in the context of a direct application in the content area.
Contents	• Agents for information research, algorithmic embedding and association techniques (e.g. TF-IDF) • Representation learning for sequential structures, automatic embedding: word2vec, CBOW, skip-gram with negative sampling • Natural language processing: large language models (LLMs): recurrent computational networks (with so-called LSTMs or GRUs as base units), transformation networks (e.g. BERT, GPT), basics of training generative pretrained transformers (GPTs), examples: GPT-4, ChatGPT • GPT generation parameters: Temperature and Top-P sampling, retrieval-assisted generation, embedding techniques for relational data (knowledge graphs), integration of knowledge graphs into language models, generation of knowledge graphs from texts, fine-tuning of pre-trained generative models for specific tasks, distilling models. • Prompt engineering: verbalization of context and task descriptions (including context-related GPTs), context-related learning (zero-shot vs. few-shot prompt generation) • Software development with LLMs (code generation • Image processing with convolutional networks and transformation networks: AlexNet, ResNet, transformation networks for visual data (ViT) • Vision and language: large multimodal models (ViLBERT), contrastive pre-training (CLIP) • Generation of images from textual descriptions (DALL-E) • Analysis of videos: Object detection with transformation network architectures (YOLO)
Teaching methods	Lecture: 2 SWS Seminar: 2 SWS

Language of instruction	English
Prerequisites for participation	None
Applicability of the module	Intellectics: The Science of AI M.A. Philosophy M.A. Business Administration (B.Sc.) Economics (B.Sc/M.Sc.)
Module completion	Prerequisite for registering for the module examination: Regular participation in the seminar in accordance with the provisions of Section 5 (3). The coursework to be completed (oral presentations, practicals, reports, etc.) will be announced in detail at the beginning of the course. Type of examination: Written term paper (12-15 pages, maximum completion time: 3 months) as part of the seminar. Language of the module examination: English
Workload in the individual module parts	Lecture: 3 LP Seminar: 3 LP Term paper: 2 LP
Total workload of the module	8 LP
Frequency of the offer	Annually in the winter semester
Duration	1 semester
Recommended semester	1st semester

Module type	**Compulsory module in the degree Intellectics: The Science of AI M.A.**
Title	**Agents, Intellectics, and Logic**
Module sigle	**Int13**
Qualification goals	Students have skills in all the topics listed in the bullet points under content in the area of agentic systems with reference to the topic of Intellectics. In particular, students will be able to (i) name the central ideas, (ii) define the relevant terms, (iii) explain how the associated methods and approaches work, (iv) critically reflect on and judge the possibilities, limitations, risks and effects of using these methods and approaches, and (v) apply the methods and approaches to solve typical problems in the modeling and design of systems. Students will be able to name the main research topics in intellectual science and distinguish them from AI research. Further competencies in the field of logic are acquired in the context of a direct application in the area of content-related topics.
Contents	• Agents, principle of bounded rationality: artificial intelligence, Turing test, Chinese room • Deterministic game theory and social choice functions, preference aggregation, mechanisms of agents • Social mechanisms: goal-oriented interaction of agents and humans, design of social mechanisms, intellect as science • Fundamentals of model building in social mechanisms (propositional logic, first and second order predicate logic, modal logic, epistemic logic, knowledge and vision, knowledge and time, dynamic epistemic logic, doxastic logic, justification logic, knowledge-based programs)
Teaching methods	Lecture: 2 SWS Seminar: 2 SWS
Language of instruction	English
Prerequisites for participation	None
Applicability of the module	Intellectics: The Science of AI M.A. Philosophy M.A. Business Administration (B.Sc.) Economics (B.Sc/M.Sc.)
Module completion	Prerequisite for registering for the module examination: Regular participation in the seminar in accordance with the provisions of Section 5 (3). The coursework to be completed (oral presentations, practicals, reports, etc.) will be announced in detail at the beginning of the course. Type of examination: Written term paper (12-15 pages, maximum completion time: 3 months) as part of the seminar. Language of the module examination:

	English
Workload in the individual module parts	Lecture: 3 LP Seminar: 3 LP Term paper: 2 LP
Total workload of the module	8 LP
Frequency of the offer	Annually in the winter semester
Duration	1 semester
Recommended semester	1st semester

Module type	**Compulsory module in the degree** **Intellectics: The Science of AI M.A.**
Title	**Perception: Natural Language Processing and Computer Vision**
Module sigle	**Int21**
Qualification goals	Students have skills in all the topics listed in the bullet points under content in the area of perception. The module expands the skills for training models and generative AI to include skills for developing new methods for (statistical) processing of natural language and computer vision. Students are able to (i) name the central ideas, (ii) define the relevant terms, (iii) explain how the associated methods and approaches work, (iv) critically reflect on and assess the possibilities, limitations, risks and effects of using these methods and approaches and (v) apply and further develop the methods and approaches to solve typical problems in the modeling and design of systems. Students are able to understand and explain research questions currently being discussed in the field of multimodal perception and to discuss them with a professional background with regard to their impact on society and research.
Contents	• Stochastic basics: Markov networks, Markov random fields, dynamic Bayesian networks, queries and query response algorithms, sampling methods, learning methods for incomplete data (expectation-maximization: EM, Baum-Welch method), PAC learning principle • Probabilistic language models, topic models, latent Dirichlet allocation (LDA), thematic developments over time represented by dynamic Bayesian networks • Transformation networks as probabilistic models, training methods for convolutional and transformation networks, application-specific training through fine-tuning (deep and shallow), integration of special (symbolic) problem solvers in GPTs, differential programming • Probabilistic computational networks (e.g. with applications in image processing), query answering and scalability, transformation of probabilistic models to probabilistic computational networks, control of large language models with probabilistic models • Generation of relevant new objects to simplify finding solutions to problems (e.g. AlphaGeometry, FunSearch) • Generative modeling of data (e.g. images): Generation of images and videos: Variational autoencoder with vector quantization (DALL-E), denoising diffusion, outpainting and inpainting • Construction of complex probability distributions through a series of invertible transformations: Normalizing Flows, Combination with Probabilistic Computational Networks, Generating Adversarial Networks (GANs)
Teaching methods	Lecture: 2 SWS Seminar: 2 SWS

Language of instruction	English
Prerequisites for participation	None, the prior acquisition of competencies as formulated in the descriptions of the modules "Understanding Data vs Machine Training" (Int11) and "GenAI in Education, Science, and Society" (Int12) is recommended.
Applicability of the module	Intellectics: The Science of AI M.A.
Module completion	Prerequisite for registering for the module examination: Regular participation in the seminar in accordance with the provisions of Section 5 (3). The coursework to be completed (oral presentations, practicals, reports, etc.) will be announced in detail at the beginning of the course. Type of examination: Written term paper (12-15 pages, maximum completion time: 3 months) as part of the seminar. Language of the module examination: English
Workload in the individual module parts	Lecture: 3 LP Seminar: 3 LP Term paper: 2 LP
Total workload of the module	8 LP
Frequency of the offer	Annually in the summer semester
Duration	1 semester
Recommended semester	2nd semester

Module type	**Compulsory module in the degree Intellectics: The Science of AI M.A.**
Title	**Planning and Decision Processes**
Module sigle	**Int22**
Qualification goals	Compared to the skills acquired in the modules on model training and generative AI, students have advanced skills in all topics listed in the bullet points under content in the areas of planning and decision-making processes for agentic systems. In particular, students are able to (i) name the central ideas, (ii) define the relevant terms, (iii) explain how the associated methods and approaches work, (iv) critically reflect on and assess the possibilities, limits, risks and effects of using these methods and approaches and (v) apply and further develop the methods and approaches to solve typical problems in the modeling and design of systems. Students are able to understand and evaluate research questions currently discussed in the world in the field of planning with a professional background and to discuss them with regard to possible effects on society, economy and science.
Contents	Topics • Planning and acting with deterministic models, Contrary planning for games: Minimax principle, execution of sequential plans: prediction • Planning and acting with temporal models • Planning and acting with probabilistic models • Decision theory, Markov decision processes (MDPs), with and without full information about the current state (POMDPs), centralized and decentralized control (DEC-POMDPs) • Reinforcement learning • Exploration vs. exploitation, theory of multi-armed bandits, Monte-Carlo tree search (AlphaZero) • Factorization for decision-making processes
Teaching methods	Lecture: 2 SWS Seminar: 2 SWS
Language of instruction	English
for participation	None, the prior acquisition of competencies as formulated in the descriptions of the modules "Understanding Data vs. Machine Training" (Int11), "GenAI in Education, Science, and Society" (Int12) and "Agents, Intellectics, and Logic" (Int13) is recommended.
of the module	Intellectics: The Science of AI M.A.
Module completion	Prerequisite for registering for the module examination: Regular participation in the seminar in accordance with the provisions of Section 5 (3). The coursework to be completed (oral presentations, practicals, reports, etc.) will be announced in detail at the beginning of the course. Type of examination: Written term paper (12-15 pages, maximum completion time: 3 months) as part of the seminar.

	Language of the module examination: English
in the individual module parts	Lecture: 3 LP Seminar: 3 LP Term paper: 2 LP
Total workload of the module	8 LP
Frequency of the offer	Annually in the summer semester
	1 semester
Recommended semester	2nd semester

Module type	**Compulsory module in the degree** **Intellectics: The Science of AI M.A.**
Title	**Uncertainty, Causality, and Conditionals**
Module sigle	**Int23**
Qualification goals	As an extension of the competencies in the area of logic in intellectuals, students have competencies in all topics listed in the bullet points under content in the areas of uncertainty, causality and conditional logic. In particular, students are able to (i) name the central ideas, (ii) define the relevant terms, (iii) explain how the associated methods and approaches work, (iv) critically reflect on and judge the possibilities, limits, risks and effects of using these methods and approaches and (v) apply and further develop the methods and approaches to solve typical problems in the modeling and design of systems. Students are able to discuss central research questions in the field of Intellectics with a sound technical background with regard to possible effects on society, economy and science.
Contents	• Bayesian epistemology • Causal models (Pearl), actual causality (Halpern) • D-separation • Do-calculus • IC, PC algorithm for the acquisition of causal models • Intervention • Counterfactual conditionals in the do calculus • Multi-valued logic for conditionals • Knowledge revision and (counterfactual) conditionals • Non-monotonic logics and preference semantics • Probabilistic logics
Teaching methods	Lecture: 2 SWS Seminar: 2 SWS
Language of instruction	English
Prerequisites for participation	None, the prior acquisition of competencies as formulated in the description of the module "Agents, Intellectics, and Logic" (Int13) is recommended.
Applicability of the module	Intellectics: The Science of AI M.A. Philosophy M.A. Business Administration (B.Sc.) Economics (B.Sc/M.Sc.)
Module completion	Prerequisite for registering for the module examination: Regular participation in the seminar in accordance with the provisions of Section 5 (3). The coursework to be completed (oral presentations, practicals, reports, etc.) will be announced in detail at the beginning of the course. Type of examination: Written term paper (12-15 pages, maximum completion time: 3 months) as part of the seminar. Language of the module examination:

	English
Workload in the individual module parts	Lecture: 3 LP Seminar: 3 LP Term paper: 2 LP
Total workload of the module	8 LP
Frequency of the offer	Annually in the winter semester
Duration	1 semester
Recommended semester	2nd semester

Module type	Compulsory module in the degree Intellectics: The Science of AI M.A.
Title	**Human-compatible AI**
Module sigle	**Int31**
Qualification goals	As an extension of the competencies on perception and action planning of agents, students have competencies on all topics listed in the bullet points under content in the area of human-compatible behavior of agentic systems. In particular, students are able to (i) name the central ideas, (ii) define the relevant terms, (iii) explain how the associated methods and approaches work, (iv) critically reflect on and assess the possibilities, limits, risks and effects of using these methods and approaches and (v) apply and further develop the methods and approaches to solve typical problems in the modeling and design of systems. Students are able to discuss central research questions in the field of Intellectics with a sound technical background with regard to possible effects on society, economy and science.
Contents	• Demonstrably useful and well-founded AI, probabilistic safety guarantees, switch-off problem • Human-aware and human-centric AI: Mental models, interpretable behavior and generation of explanations, agent-assisted human collaboration, aligned AI, analogies and common sense • Adaptation of language models: Reinforcement learning with human feedback (PPO method) • Task-oriented perception: from task descriptions to internal goals, task representations • Basics of assistance games, perception of human preferences, inverse reinforcement learning • Simulation of the behavior of agents in mechanisms, Durkheim test, Weizenbaum test
Teaching methods	Lecture: 2 SWS Seminar: 2 SWS
Language of instruction	English
Prerequisites for participation	None, the prior acquisition of competencies as formulated in the descriptions of the modules "Perception: Natural Language Processing and Computer Vision" (Int21) and "Planning and Decision Processes" (Int22) is recommended.
Applicability of the module	Intellectics: The Science of AI M.A.
Module completion	Prerequisite for registering for the module examination: Regular participation in the seminar in accordance with the provisions of Section 5 (3). The coursework to be completed (oral presentations, practicals, reports, etc.) will be announced in detail at the beginning of the course. Type of examination: Written term paper (12-15 pages, maximum completion time: 3 months) as part of the seminar.

	The exact type of term paper will be announced by the lecturer at the beginning of the course. Language of the module examination: English
Workload in the individual module parts	Lecture: 3 LP Seminar: 3 LP Term paper: 2 LP
Total workload of the module	8
Frequency of the offer	Annually in the winter semester
Duration	1 semester
Recommended semester	3rd semester

Module type	**Compulsory module in the degree Intellectics: The Science of AI M.A.**
Title	**Probabilistic Foundation Models**
Module sigle	**Int32**
Qualification goals	The students have competencies in all topics listed in the bullet points under content in the area of fundamental probabilistic models, whereby an expansion of competencies regarding uncertainty, causality and conditional logic is achieved. In particular, students are able to (i) name the central ideas, (ii) define the relevant terms, (iii) explain how the associated methods and approaches work, (iv) critically reflect on and judge the possibilities, limits, risks and effects of using these methods and approaches and (v) apply and further develop the methods and approaches to solve typical problems in the modeling and design of systems. Students are able to understand and further develop solutions for central research questions in the field of Intellectics with a sound technical background.
Contents	• Probabilistic relational models (PRMs), lifted inference: lifted variable elimination, lifted branching tree algorithm, model counting methods (first order and algebraic type), relational probabilistic computational networks • Sequential (e.. discrete-time) modeling and inference with PRMs, taming of PRMs over time (retrospective and progressive • Machine learning for PRMs • Decision-making and planning with PRMs and under causality considerations • Dynamic extensions of the state space: Generative dynamic causal probabilistic-relational models for stochastic games (genDC-SG-PRMs) • PRMs and LLMs
Teaching methods	Lecture: 2 SWS Seminar: 2 SWS
Language of instruction	English
for participation	None, the prior acquisition of skills as formulated in the descriptions of the modules "Perception: Natural Language Processing and Computer Vision" (Int21), "Planning and Decision Processes" (Int22) and "Uncertainty, Causality, and Conditions" (Int 23) is recommended.
of the module	Intellectics: The Science of AI M.A.
Module completion	Prerequisite for registering for the module examination: Regular participation in the seminar in accordance with the provisions of Section 5 (3). The coursework to be completed (oral presentations, practicals, reports, etc.) will be announced in detail at the beginning of the course. Type of examination: Written term paper (12-15 pages, maximum completion time: 3 months) as part of the seminar.

	Language of the module examination: English
in the individual module parts	Lecture: 3 LP Seminar: 3 LP Term paper: 2 LP
Total workload of the module	8
Frequency of the offer	Annually in the winter semester
Duration	1 semester
Recommended semester	3rd semester

Module type	**Compulsory module in the degree** **Intellectics: The Science of AI M.A**
Title	**Social Mechanisms, Social Epistemology, and Formal Ethics**
Module sigle	**Int33**
Qualification goals	As an extension of competencies in the area of uncertainty, causality and conditional logic, students also have competencies in all topics listed in the bullet points under content in the areas of design of social mechanisms, social epistemology and design of agents in social systems, so that aspects of formal ethics can be illuminated. In particular, students are able to (i) name the central ideas, (ii) define the relevant terms, (iii) explain how the associated methods and approaches work, (iv) critically reflect on and judge the possibilities, limits, risks and effects of using these methods and approaches, and (v) apply and further develop the methods and approaches to solve typical problems in the modeling and design of systems. Students are able to discuss central research questions in the field of Intellectics with a sound technical background with regard to possible effects on society, economy and science.
Contents	• Cooperation between agents, rules of cooperation • Social epistemology • Probabilistic game theory and social mechanisms from a logical perspective • Deontic logic • Normative systems and argumentation theory • Formal ethics
Teaching methods	Lecture: 2 SWS Seminar: 2 SWS
Language of instruction	English
Prerequisites for participation	None, the prior acquisition of competencies as formulated in the descriptions of the module "Uncertainty, Causality, and Conditionals" (Int23) is recommended.
Applicability of the module	Intellectics: The Science of AI M.A. Philosophy M.A. Business Administration (B.Sc.) Economics (B.Sc/M.Sc.)
Module completion	Prerequisite for registering for the module examination: Regular participation in the seminar in accordance with the provisions of Section 5 (3). The coursework to be completed (oral presentations, practicals, reports, etc.) will be announced in detail at the beginning of the course. Type of examination: Written term paper (12-15 pages, maximum completion time: 3 months) as part of the seminar. Language of the module examination:

	English
Workload in the individual module parts	Lecture: 3 LP Seminar: 3 LP Term paper: 2 LP
Total workload of the module	8 LP
Frequency of the offer	Annually in the winter semester
Duration	1 semester
Recommended semester	3rd semester

Module type	**Compulsory module in the degree Intellectics: The Science of AI M.A.**
Title	**Final module**
Module sigle	
Qualification goals	Students have acquired the ability to independently develop scientific subject areas and problem areas in the field of artificial intelligence. They are able to present their work in a systematic and differentiated manner in a written paper and a technical discussion.
Contents	Preparation and writing of the Master's thesis Preparing and giving the presentation
Teaching methods	Students' own work under supervision
Language of instruction	English
Prerequisites for participation	Successful completion of modules in the degree program Intellectics: The Science of AI M.A. amounting to 54 LP
Applicability of the module	Intellectics: The Science of AI M.A.
Module completion	Type of examination: Master's thesis with a total length of 60-100 pages. Oral examination as part of the presentation (60 min including presentation time) Language of the module examination: English
Workload in the individual module parts	Master's thesis: 25 LP Presentation and oral examination (incl. preparation time): 5 CP
Total workload of the module	30 LP
Frequency of the offer	Every semester
Duration	5 months
Recommended semester	4th semester

Re § 22
Entry into force

These subject-specific regulations enter into force on the day following their publication as an official announcement of Universität Hamburg. They apply for the first time to students commencing their studies in the winter semester 2025/2026.

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