

# **Master Artificial Intelligence**

## **Appendix I Teaching outcomes of the degree programme (art. 1.3)**

1. The master demonstrates knowledge, understanding and the ability to evaluate, analyze and interpret relevant data, all on a level that builds on and surpasses the level of the bachelor Artificial Intelligence, in at least five of the research areas below. In one research area of Artificial Intelligence the master has specialized knowledge at a forefront level.
  - a. The symbolic approach to Artificial Intelligence
  - b. The numerical, non-symbolic approach to Artificial Intelligence
  - c. Computational theories of perception and cognition
  - d. Agent systems
  - e. Linguistics and language- and speech technology
  - f. Autonomous systems and robotics
  - g. Machine learning and pattern recognition
2. The master demonstrates knowledge and understanding, on a level that builds on and surpasses the level of the bachelor Artificial Intelligence, in the empirical sciences (Psychology, Biology and Physics) and has experience applying and analyzing results thereof.
3. The master demonstrates relevant knowledge and the ability to apply methods and techniques from mathematics and logic used in Artificial Intelligence.
4. The master demonstrates relevant knowledge and the ability to use algorithms, data structures and important programming languages used in Artificial Intelligence.
5. The master has the ability to, on an international academic level, analyze problems, critically and constructive review both one's own and other scientific results, even if incomplete, and communicate about this both individually as in a group, both oral and in written form, also in a broader societal context, for both specialists and non-specialists.
6. The master has the ability to critically reflect on one's own working method and knowledge and to recognize the need for continued learning on a high degree of autonomy, and is able to understand the scientific developments within the field of Artificial Intelligence.

## **Appendix II Specializations of the degree programme (art. 2.2)**

Students must choose one of the following specializations:

- a) specialization Computational Intelligence and Robotics
- b) specialization Multi-Agent Systems

## Appendix III Content of the degree programme (art. 2.3)

1. The **degree programme** consists of the following compulsory modules with a study load of 5 ECTS unless otherwise stated, with their related form of examination:

Compulsory modules with a study load of 5 ECTS, unless otherwise stated	Form of examinations <sup>1</sup>							
	A	CA	IA	RA	PP	RP	WE	PR
Cognitive Robotics	X				X			X
Machine Learning			X				X	
Multi-Agent Systems	X		X					X
Perception				X	X			X
Final Research project (45 ECTS)						X		

In individual cases the Board of Examiners may define one other compulsory module (5 ECTS) from the following fields: Logic, Artificial Intelligence, Knowledge Systems, Autonomous Systems, Mathematics, Statistics or Computer Science.

2. The different **specializations** also contain the following compulsory modules with a study load of 5 ECTS, with their related form of examination:

### Computational Intelligence and Robotics

Compulsory modules with a study load of 5 ECTS, unless otherwise stated	Form of examinations <sup>1</sup>							
	A	CA	DA	IA	PP	RP	WE	PR
Signals and Systems	X	X					X	
Handwriting Recognition				X	X			X
Robotics			X	X	X			
Sound Recognition			X	X			X	

### Multi-Agent Systems

Compulsory modules with a study load of 5 ECTS, unless otherwise stated	Form of examinations <sup>1</sup>							
	A	DA	IA	RA	PP	RP	WE	PR
Arguing Agents	X						X	X
Cognitive Modeling – Basic Principles and Methods	X			X	X			
Design of Multi-Agent Systems			X				X	X

#### <sup>1</sup>Form of examinations:

A: assignments; CA: computer assignment; DA: design assignment; IA: implementation assignment; IS: internship; RA: research assignment; PP: paper; RP: research project; WE: written exam; PR: oral presentation

## Appendix IV Optional course units (art. 2.4)

1. With the approval of the Board of Examiners, a student may choose one or more of the following optional modules with a study load of 5 ECTS, with their related form of examination:

Elective courses with a study load of 5 ECTS, unless otherwise stated	Form of examinations <sup>1</sup>							
	A	CA	DA	IA	RA	PP	WE	PR
Arguing Agents	X						X	X
Auditory Biophysics					X			X
Cognitive Engineering			X		X	X	X	
Cognitive Modeling – Basic Principles and Methods	X				X	X		
Cognitive Modeling – Complex Behaviour	X				X	X		
Computational Cognitive Neuroscience	X					X		X
Computational Discourse	X	X						X
Design of Multi-Agent Systems				X			X	X
Handwriting Recognition				X		X		X
Language Modeling					X	X		X
Neuro-ergonomics						X		
Robotics			X	X		X		
Signals and Systems	X	X					X	
Sound Recognition			X	X			X	
User Models			X			X		

### <sup>1</sup>Form of examinations:

**A:** assignments; **CA:** computer assignment; **DA:** design assignment; **IA:** implementation assignment; **IS:** internship; **RA:** research assignment; **PP:** paper; **RP:** research project; **WE:** written exam; **PR:** oral presentation

2. With the approval of the Board of Examiners, a student may also choose one or more of the following optional modules with a study load of 5 ECTS unless otherwise stated (for form of examination refer to the Teaching and Exam regulations of the appropriate Degree Programmes):

- Advanced Computer Graphics
- Advanced Self-organisation of Social Systems
- Automated Reasoning
- Computational Semantics
- Computational Simulations of Language Behaviour
- Computer Vision
- Dynamic Logic
- Natural Language Processing
- Neural Networks
- Pattern Recognition
- Philosophy of Mind II: Consciousness and Action
- Philosophy of Neuroscience
- Philosophy of Probability
- Philosophy of Science, Technology and Society: The Information Society
- Programming in C++ (part I, II and/or part III: together max. 8 ECTS; part I max. 2 ECTS)
- Robotics (Industrial Engineering)
- Scientific Visualization
- Semantic Web Technology
- Web and Cloud Computing

## **Appendix V Entry requirements and compulsory order of examinations (art. 3.2)**

- Final Research project:
  - at least 60 ECTS of degree programme
- Robotics:
  - Cognitive Robotics
- Handwriting Recognition:
  - Signals and Systems
- Multi Agent Systems:
  - Advanced Logic *or*
  - Automated Reasoning *or*
  - Logic 3 (Model, oneindigheid en paradox)

## **Appendix VI Admission to the degree programme and different specializations (art. 4.1.1 + art. 4.2)**

1. Students in possession of a Dutch or foreign certificate of higher education that indicates that they have the following knowledge and skills shall be admitted to the degree programme:
  - knowledge of and insight in the subject of Knowledge Systems
  - knowledge of and insight in the subject of Autonomous Systems
  - knowledge of and insight in the subject of Mathematics, notably discrete and continuous mathematics
  - knowledge of and insight in the subject of Statistics
  - knowledge of, insight in and practical skills in the subject of Computer Science, notably programming, data structures and search techniques
  - knowledge of and insight in the subject of Logics, notably set theory, predicate logic and modal logic
2. The holder of a certificate from the Bachelor's degree programme "Artificial Intelligence" of any university in the Netherlands is expected to have the knowledge and skills listed in Article 4.1.1 and is admitted to the degree programme on that basis.