



## **Appendices Master's Degree Programme Artificial Intelligence (MSc) 2021 – 2022**

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## **Appendix I Learning Outcomes of the Degree Programme (Article 3.1)**

1. The master demonstrates knowledge, understanding and the ability to evaluate, analyse 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 specialised knowledge at an advanced 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 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 analysing 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, analyse problems, critically and constructively 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, to both specialists and nonspecialists.
6. The master has the ability to critically reflect on his/her 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 Tracks/Specializations of the Degree Programme (Article 3.5)**

The Artificial Intelligence MSc Programme has no **tracks**.

The programme does make use of specializations. These specializations are a mandatory direction that guarantees a student is able to take a graduation project in the relevant area by the end of the specialization.

Students must choose one of the following specializations:

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



## Appendix III Content of the Degree Programm (Article 3.6)

1. The **degree programme** consists of the following mandatory course units:

<b>Mandatory Course Units (60 ECTS credit points)</b> with a study load of 5 ECTS, unless stated otherwise
Deep Learning [WMAI017-05]
Design of Multi-Agent Systems [WMAI004-05]
Machine Learning [WMAI010-05]
Final Research Project (45 ECTS credit points) [WMAI901-45]

2. In addition the fixed mandatory programme, students will also have to take the mandatory course units of one of the three programme **specializations** as referred to in Appendix II. The different specializations contain the following mandatory course units:

### Computational Intelligence

<b>Mandatory course units (15 ECTS credit points)</b> with a study load of 5 ECTS, unless stated otherwise
Cognitive Robotics [WMAI003-05]
Handwriting Recognition [WMAI019-05]
Pattern Recognition [WMAI021-05]

### Multi-Agent Systems

<b>Mandatory course units (15 ECTS credit points)</b> with a study load of 5 ECTS, unless stated otherwise
Arguing Agents [WMAI001-05]
Computational Social Choice [WMAI016-05]
Logical Aspects of Multi-Agent Systems [WMAI020-05]

### Robotics

<b>Mandatory course units (15 ECTS credit points)</b> with a study load of 5 ECTS, unless stated otherwise
Cognitive Robotics [WMAI003-05]
Pattern Recognition [WMAI021-05]
Robotics for Artificial Intelligence [WMAI011-05]



## Appendix IV Elective Course Units (Article 3.7.1)

In addition to the mandatory fixed programme and the programme specializations, the programme also consists of 45 ECTS credit points in elective course units. Students will have to fill this space of 45 credit points with one of the following three options (or combinations thereof):

1. A student may choose one or more of the following pre-approved elective course units that are offered by Artificial Intelligence or Computational Cognitive Science:

<b>Pre-approved Elective Course Units</b> with a study load of 5 ECTS, unless otherwise stated
Applied Cognitive Engineering [WMCC007-05]
Arguing Agents [WMAI001-05]
Auditory Biophysics [WMAI013-05]
Cognitive Engineering [WMCC001-05]
Cognitive Modelling – Basic Principles and Methods [WMCC006-05]
Cognitive Modelling – Complex Behaviour [WMCC008-05]
Cognitive Robotics [WMAI003-05]
Computational Cognitive Neuroscience [WMCC010-05]
Computational Simulations of Language [WMCC009-05]
Computational Social Choice [WMAI016-05]
Handwriting Recognition [WMAI019-05]
Language Modelling [WMCC003-05]
Logical Aspects of Multi-Agent Systems [WMAI020-05]
Models of Human-Syntax Processing [WMCC014-05]
Neuro-ergonomics [WMCC011-05]
Pattern Recognition [WMAI021-05]
Robotics for Artificial Intelligence [WMAI011-05]
User Models [WMCC004-05]

2. A student may choose one or more of the following pre-approved elective course units taught by other degree programmes (the study load is 5 ECTS unless stated otherwise). For the form of examination, refer to the TER or assessment plans of the relevant degree programmes):
  - Advanced Computer Graphics [WMCS006-05]
  - Advanced Imaging Techniques [WMBY015-05]
  - Advanced Self-Organisation of Social Systems [WMBY017-05]
  - Auditory and Visual Perception [WMBC002-05]
  - Computational Semantics [LIX021M05]



- Computer Vision [**WMCS015-05**]
- Fundamentals of Distributed Systems [**WMCS022-05**]
- Introduction to Data Science [**WMCS002-05**]
- Introduction Science and Business <sup>a</sup> [**WMSE001-10**]
- Introduction Science and Policy <sup>a</sup> [**WMSE002-10**]
- Language Technology Project [**LIX025M05**]
- Natural Language Processing [**LIX001M05**]
- Neural Networks and Computational Intelligence [**WMCS010-05**]
- Philosophy of Neuroscience [**FI024FK**]
- Robotics for Industrial Engineering and Management [**WMIE005-05**]
- Skills in Science Communication [**WMEC006-05**]
- Scientific Visualization [**WMCS018-05**]
- Semantic Web Technology [**LIX002M05**]
- Web and Cloud Computing [**WMCS005-05**]

*a) This course yields 10 ECTS credit points. You can take either Introduction Science and Business or Introduction Science and Policy, and will only be awarded credit points for one of the two course units.*

3. Formal approval of the Board of Examiners is required, in case and before a student would like to deviate from these rules (e.g. including course units from other programmes and universities).



## Appendix V Entry Requirements and Compulsory Order of Examinations (Article 4.4)

Course Unit Name	Entry Requirements <sup>a</sup>
Final Research Project [WMAI901-45]	<ul style="list-style-type: none"><li>- At least 60 ECTS credit points from the master's phase (students must have this study programme approved by the Board of Examiners)</li><li>- Deep Learning [WMAI017-05]</li><li>- Design of Multi-Agent Systems [WMAI004-05]</li><li>- Machine Learning [WMAI007-05]</li><li>- Completion of the specialization relevant to the final research project</li></ul>

Handwriting Recognition [WMAI019-05] has Signals and Systems [WBAI016-05] as a strongly recommended course unit. Students who did not take the Artificial Intelligence BSc are advised to (have) take(n) a comparable course unit on signal processing.

Logical Aspects of Multi-Agent Systems [WMAI020-05] has Advanced Logic [WBAI017-05] as a strongly recommended course unit. Students who did not take the Artificial Intelligence BSc are advised to (have) take(n) a comparable course unit.

a) In the event that a student has applied for a course to count as a course replacement, this replacement course also counts as a valid alternative for the course entry requirement in question.



## **Appendix VI Admission to the Degree Programme (Article 2.1A.1; Article 2.1B.1)**

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 Logic, 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 2.1 and is admitted to the degree programme on that basis.





## Appendix VII Transitional Provisions (Article 7.1)

The transitional provisions are an arrangement that students can use as a reference to courses that previously existed. Some course units or curriculum choices were previously part of the programme, but have since been updated. In some cases, an arrangement can consist of multiple courses. If a provision is not listed in the list of transitional arrangements, students will have to ask the permission of the Board of Examiners first – through a course replacement. The provisions are listed in reverse-chronological order. General provisions are described through text – courses that are a direct replacement for a current course are listed in table format.

### Students who started in 2020 – 2021 or before:

Discontinued Course Unit(s)				Replacement Course Unit(s)		
Course Name	Course Code	ECTS credit points	Final Exam Opportunity	Course Name	Course Code	ECTS credit points
Pattern Recognition	WMCS011-05	5	Course unit still exists	Pattern Recognition	WMAI021-05	5

### Students who started in 2019 – 2020 or before:

There are no further transitional provisions in the Artificial Intelligence MSc degree programme – except that Dynamic Logic [INMDL-08] is considered a valid (pre-approved) elective under the programme, despite no longer being offered. The current curriculum is compatible with most older versions of the Teaching- and Examination Regulations. Cases not listed in the Teaching and Examination Regulations - through either the current curriculum or the transitional provisions listed - are only valid in consultation with, and through approval of, the Board of Examiners of the degree programme.

However, below, you can find a table of courses that are considered equivalent – but have changed course codes since 2020 - 2021. While the course codes of these courses are different, they are considered equal for the intents and purposes of your MSc diploma: you do not have to take the version that is listed in the current Teaching- and Examination regulations – and can use the ‘Old Course Code’ version instead. Note that this list only contains courses that have been part of previous Teaching- and Examination regulations, and only courses that have not changed their name (otherwise it is a discontinued course unit/replacement course unit pair, listed in the TER of the organizing programme). Any other equivalences that may exist between courses that can be beneficial in the event of a course replacement or a potential block in the event of a free-choice elective will have to be checked with the Board of Examiners of your own degree programme.



Course Name	Old Course Code	New Course Code	ECTS Credit Points
<b>Organized by Artificial Intelligence (MSc)</b>			
Arguing Agents	KIM.AA08	WMAI001-05	5
Auditory Biophysics	KIM.AB09	WMAI013-05	5
Cognitive Robotics	WMAI19001	WMAI003-05	5
Computational Social Choice	WMAI19002	WMAI016-05	5
Deep Learning	WMAI18002	WMAI017-05	5
Design of Multi-agent Systems	KIM.DMAS04	WMAI004-05	5
Final Research Project	KIM.AFAI06	WMAI901-45	45
Hand-writing Recognition	KIM.SCHR03	WMAI019-05	5
Logical Aspects of Multi-agent Systems	WMAI19003	WMAI020-05	5
Machine Learning	KIM.ML09	WMAI010-05	5
Robotics for AI	KIM.ROB03	WMAI011-05	5
<b>Organized by Other Programmes (Mandatory / Specialization)</b>			
Cognitive Modelling: Basic Principles and Methods	KIM.CMB11	WMCC006-05	5
Pattern Recognition	INMPR-08	WMCS011-05	5
<b>Organized by Other Programmes (Pre-approved Elective)</b>			
Advanced Computer Graphics	INMACG-08	WMCS006-05	5
Advanced Imaging Techniques	MLBI0901	WMBY015-05	5
Advanced Self-organisation of Social Systems	MLBI0801	WMBY017-05	5
Applied Cognitive Engineering	WMAI19004	WMCC007-05	5
Auditory and Visual Perception	WMBC13001	WMBC002-05	5
Cognitive Engineering	KIM.CE11	WMCC001-05	5
Cognitive Modelling: Basic Principles and Methods	KIM.CMB11	WMCC006-05	5
Cognitive Modelling: Complex Behaviour	KIM.CMC11	WMCC008-05	5
Computational Cognitive Neuroscience	KIM.CCN11	WMCC010-05	5
Computational Simulations of Language	WMAI18003	WMCC009-05	5
Computer Vision	INMCV-08	WMCS015-05	5



Introduction to Data Science	WMCS16002	WMCS002-05	5
Introduction to Science and Business	WNBIBEB08A	WMSE001-10	10
Introduction to Science and Policy	WNBIBEB08B	WMSE002-10	10
Language Modelling	KIM.LM04	WMCC003-05	5
Neural Networks and Computational Intelligence	WMCS15001	WMCS010-05	5
Neuro-ergonomics	KIM.NE06	WMCC011-05	5
Pattern Recognition	INMPR-08	WMCS011-05	5
Robotics for IEM	TBROB-12	WMIE005-05	5
Scientific Visualisation	INMSV-08	WMCS018-05	5
Skills in Science Communication	WMEC13004	WMEC006-05	5
User Models	KIM.UM03	WMCC005-05	5
Web and Cloud Computing	INMWCC-12	WMCS005-05	5



## **Appendix VIII Additional Requirements Open Degree Programmes (Article 5.6)**

Students are permitted to obtain a diploma in the Artificial Intelligence MSc programme without fully fitting the curriculum set out in Appendix III and Appendix IV. This can only happen in consultation with, and through approval of, the Board of Examiners of the degree programme. Students are required to finish an MSc Project, to guarantee they are able to function as an MSc level researcher in line with the Dublin level descriptors / Framework for Qualifications of the European Higher Education Area, and are required to fit the Learning Outcomes of the programme (set out in Appendix I). These Learning Outcomes have been established in accordance with the AI MSc Framework of Reference of the Netherlands.



## Appendix IX Application and Decision Deadlines for Admission (Article 2.6.1; Article 2.6.3)

### Programmes starting on 1 September 2021

Programme	Deadline of Application	Deadline of decision
Behavioural and Cognitive Neurosciences	1 May 2021	1 June 2021
Biology	1 May 2021	1 June 2021
Biomedical Engineering	1 May 2021	1 June 2021
Biomedical Sciences	1 May 2021	1 June 2021
Biomolecular Sciences	1 May 2021	1 June 2021
Computational Cognitive Science	1 May 2021	1 June 2021
Ecology and Evolution	1 May 2021	1 June 2021
Energy and Environmental Sciences	1 May 2021	1 June 2021
Marine Biology	1 May 2021	1 June 2021
Mechanical Engineering	1 May 2021	1 June 2021
Medical Pharmaceutical Sciences	1 May 2021	1 June 2021
Nanoscience: for non-EU/EEA students	1 February 2021	1 June 2021
Nanoscience: for EU/EEA students	1 May 2021	1 June 2021
Science Education and Communication	1 May 2021	1 June 2021

### Programmes starting on 1 September 2021 and 1 February 2022

Programme	Deadline of Application for 1 September	Deadline of decision for 1 September	Deadline of Application for 1 February	Deadline of decision for 1 February
Applied Mathematics	1 May 2021	1 June 2021	15 October 2021	15 November 2021
Applied Physics	1 May 2021	1 June 2021	15 October 2021	15 November 2021
Artificial Intelligence	1 May 2021	1 June 2021	15 October 2021	15 November 2021
Astronomy	1 May 2021	1 June 2021	15 October 2021	15 November 2021
Chemical Engineering	1 May 2021	1 June 2021	15 October 2021	15 November 2021
Chemistry	1 May 2021	1 June 2021	15 October 2021	15 November 2021
Computing Science	1 May 2021	1 June 2021	15 October 2021	15 November 2021
Farmacie	1 May 2021	1 June 2021	15 October 2021	15 November 2021
Industrial Engineering and Management	1 May 2021	1 June 2021	15 October 2021	15 November 2021
Mathematics	1 May 2021	1 June 2021	15 October 2021	15 November 2021
Physics	1 May 2021	1 June 2021	15 October 2021	15 November 2021



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