

Assessment plan for the curriculum of the Bachelor's degree programme in Artificial Intelligence, 2024-2025

Programme director: Prof. Dr. J.P. Borst

Date advice Board of Examiners: June 7th, 2024

Date approval Faculty Board:

1. Vision on assessment

1. to provide students with a broad perspective on the field of AI, assessment includes items that require transfer of student knowledge and understanding to all specializations within the field of AI as specified in the learning outcomes
2. to provide students with implementation skills in addition to theoretical knowledge, assessment includes practical assignments on all specializations in the field of AI
3. to ensure students master all relevant skills for a course unit, grades are not dominated by one specific mode of assessment
4. to stimulate students' ability for critical reflection, assessment will include components for self and peer evaluation
5. to stimulate students to work in culturally diverse groups, assessment of group assignments will include collaboration criteria
6. to design teaching and assessment according to a learning pathway, course coordinators will jointly implement assessment strategies for subsequent courses within a learning pathway

2. Assessment guidelines

1. all courses need a minimum of two summative assessment activities
2. final tests or assessments that contribute substantially to the final grade are reviewed by a second examiner
3. for summative assessment counting 25% or less to the final grade, informal formative assessment activities can be used. For summative assessment counting more than 25% towards the final grade a formal formative assessment activity needs to be in place.
informal formative assessment = ad hoc Q and A or feedback during lectures and tutorials
formal formative assessment = a mock exam similar to the actual exam or feedback that is based on the actual grading tool in case of an assignment
4. how students can use supporting materials and supporting (AI) tools is explicitly stated for all graded assignments
5. in all courses where the use of supporting materials or supporting tools is prohibited, a supervised assessment item is included
6. for group work, part of the grade is dedicated to criteria related to collaboration and organization within groups
7. for all self and peer assessment a valid grading rubric needs to be provided to students

3. Learning outcomes of the degree programme

Learning Outcome	
<i>At the end of the programme, the graduate demonstrates knowledge, understanding, and the ability to evaluate, analyse and interpret relevant data in the field of...</i>	
1	the symbolic approach to Artificial Intelligence, and has the ability to apply this.
2	the numerical, non-symbolic approach to Artificial Intelligence, and has the ability to apply this.
3	computational models of cognitive processes and has expertise in constructing and applying this.
4	autonomous systems and robotics and has the ability to apply this.
5	linguistics and language technology and has the ability to apply this.
6	knowledge and agent systems and has expertise in designing, implementing and applying these.
<i>At the end of the programme, the graduate has knowledge and understanding of...</i>	
7	the most important philosophical theories developed in the areas of artificial intelligence and cognition.
8	relevant theories developed in the area of empirical sciences, psychology, biology and physics and has experience applying and analysing results thereof.
<i>At the end of the programme, the bachelor has relevant knowledge and ability...</i>	
9	to apply methods and techniques from mathematics and logic used in Artificial Intelligence.
10	to use algorithms, data structures and important programming languages used in Artificial Intelligence.
<i>At the end of the programme, the bachelor has the ability...</i>	
11	on an academic level, to analyse problems, critically review scientific results and communicate about this both individually as well as in a group, both oral and in written form, also in a broader societal context.
12	to critically reflect on one's own working method and to recognize the need for continued learning on a high degree of autonomy, also in the context of a master or a specialist profession.

4. Overview of assessment methods, test moments for course units, and examiners

The abbreviations for the relevant assessment methods used in below table are the following:

- Written Exam (WE)
- Multiple Choice (MC)
- Oral Exam (OR)
- Report (R)
- Presentation (P)
- Practical Work (PR)
- Assignment (AST)

Year	Period	Course	Course code	EC	Assessment methods	Does (part of the) assessment have a formative function?	Test moment(s) (e.g. mid-term (MT), end-term (ET), continuous assessment (CA), exam week (EW), etc)	First examiner	Second examiner
Mandatory Course Units									
1	1a	Introduction to Artificial Intelligence	WBAI004-05	5	AST	No	CA	N.A. Taatgen	S.K. Mehlhorn
1	1a	Autonomous Systems	WBAI002-05	5	WE, MC, R	Yes	CA, EW	P.A. Vogt	S.H. Mohades Kasaei
1	1a-1b	Imperative Programming (for AI)	WBAI003-05	5	WE, AST	Yes	CA, MT, EW	H.A. de Weerd	M. Zullich
1	1a-1b	Calculus for Artificial Intelligence	WBAI048-05	5	WE	Yes	MT, EW	R. Luppens	A.E. Sterk
1	1b	Basic Scientific Skills	WBAI010-05	5	AST, R, P	Yes	CA, ET	S.K. Mehlhorn	F. Cnossen
1	1b	Introduction to Logic	WBAI012-05	5	WE, AST	Yes	CA, MT, EW	D. Grossi	L.C. Verbrugge
1	2a	Algorithms and Data Structures	WBAI018-05	5	WE, AST	Yes	CA, EW	H.A. de Weerd	M. Zullich
1	2a	General Linguistics	WBAI022-05	5	WE, AST	Yes	CA, EW	S.D. Tokac	S.M. Jones
1	2a	Cognitive Psychology	WBAI021-05	5	WE, P, AST, R	Yes	CA, EW	F. Cnossen	S.K. Mehlhorn
1	2b	Fundamental Artificial Intelligence	WBAI063-05	5	WE, MC, PR, R, AST	No	CA, EW	J.D. Dibangoye	J.D. Cardenas Cartagena
1	2b	Introduction to the Brain	WBAI026-05	5	WE, P, AST	Yes	CA, EW	M.K. van Vugt	S.K. Mehlhorn
1	2b	Linear Algebra and Multivariable Calculus	WBAI050-05	5	WE, AST, IT	Yes	CA, MT, EW	TBD	TBD
2	1a	Object-Oriented Programming (for AI)	WBAI045-05	5	WE, PR, AST	No	CA, EW	M. Zullich	R.F. Cunha

Year	Period	Course	Course code	EC	Assessment methods	Does (part of the) assessment have a formative function?	Test moment(s) (e.g. mid-term (MT), end-term (ET), continuous assessment (CA), exam week (EW), etc)	First examiner	Second examiner
2	1a	Knowledge and Agent Systems	WBAIo57-05	5	MC, R, PR	Yes	CA, EW	H.B. Verheij	L.C. Verbrugge
2	1a	Statistics	WBAIo49-05	5	WE, AST	Yes	CA, EW	H.A. de Weerd	M.K. van Vugt
2	1b	Architectures of Intelligence	WBAIo09-05	5	WE, AST	Yes	CA, EW	J.P. Borst	N.A. Taatgen
2	1b	Introduction to Machine Learning	WBAIo56-05	5	WE, AST	Yes	CA, EW	M.A. Valdenegro Toro	A.I. Sburlea
2	1b	Signals and Systems	WBAIo16-05	5	WE, AST	Yes	CA, EW	J.D. Cardenas Cartagena	H.A. de Weerd
2	2a	Advanced Logic	WBAIo17-05	5	WE, AST	Yes	CA, EW	L.C. Verbrugge	J.D. Top
2	2a	Philosophy of AI and Cognition *	FI203AI	5	*	*	*	*	*
2	2a	Natural Language Processing	WBAIo59-05	5	WE, R, PR, AST	No	CA, EW	T.M. Tashu	M.A. Valdenegro Toro
2	2b	Data Science	WBAIo64-05	5	WE, AST	Yes	CA, EW	M.K. van Vugt	H.A. de Weerd
2	2b	Applied Machine Learning	WBAIo65-05	5	AST, PR	Yes	CA, ET	I.P. de Jong	H. Jaeger
3	2a	Ethics in Artificial Intelligence	WBAIo40-05	5	WE, P	Yes	MT, CA, EW	Z.L. Christoff	L.C. Verbrugge
3	2a-2b (1a-1b)	Bachelor's Project	WBAIo01-15	15	R, P, AST	No	ET	Project Supervisors **	
Practical Course Units (15 ECTS mandatory)									
3	1a	Cognitive Ergonomics practical	WBAIo25-05	5	R, P, PR, AST	Yes	ET	M.B. Schippers	J.O. van Bijsterveld
3	1a	Machine Learning for Industry	WBAIo70-05	5	R, P	Yes	CA	J.D. Cardenas Cartagena	M.A. Valdenegro Toro
3	1b	Knowledge Technology practical	WBAIo14-05	5	R, P, AST	Yes	CA, ET	H.B. Verheij	TBD
3	1b	Language Technology Practical	WBAIo27-05	5	R, PR, AST, P	Yes	CA, ET	T.M. Tashu	S.D. Tokac
3	1b	Reinforcement Learning Practical	WBAIo15-05	5	R, P, PR, AST	Yes	CA, ET	M. Sabatelli	J.D. Dibangoye
3	2a	Cognitive Modelling Practical	WBAIo20-05	5	R, P, AST	Yes	CA, ET	S.M. Jones	M.K. van Vugt
3	2a	Social Robotics Practical	WBAIo62-05	5	AST, R, P	Yes	CA, ET	P.A. de Vogt	TBD
2, 3	2b	Agent Technology Practical	WBAIo46-05	5	R, P, AST	Yes	CA, ET	J.D. Top	H.A. de Weerd
2, 3	2b	Robotics Practical	WBAIo66-05	5	AST	No	CA	Vacancy	R. Carloni
Elective Course Units (organized by Own Degree Programme)									

Year	Period	Course	Course code	EC	Assessment methods	Does (part of the) assessment have a formative function?	Test moment(s) (e.g. mid-term (MT), end-term (ET), continuous assessment (CA), exam week (EW), etc)	First examiner	Second examiner
3	1a	Neural Networks	WBAIo28-05	5	WE, MC, R, PR	No	ET, EW	H. Jaeger	M. Sabatelli
3	1a	Introduction to Robotics	WBAIo67-05	5	R, AST	Yes	CA	R. Carloni	S.H. Mohades Kasaei
3	1a	Large Language Models	WBAIo68-05	5	R, P, PR, AST	No	CA, ET	T.M. Tashu	S.D. Tokac
3	1a	Reinforcement Learning	WBAIo61-05	5	WE, AST	Yes	CA, EW	R.F. Cunha	M. Sabatelli
3	1b	Domain Analysis	WBAIo58-05	5	R, P, AST	Yes	CA	J.O. van Bijsterveld	M.B. Schippers
3	1b	Hybrid Intelligence	WBAIo69-05	5	R, P	Yes	ET	H.A. de Weerd	TBD
3	1b	Social Robotics	WBAIo71-05	5	WE, MC, AST	Yes	CA, EW	P.A. Vogt	TBD
3	2a	Human Language Learning	WBAIo72-05	5	TBD	TBD	TBD	J.C. van Rij-Tange	TBD
2, 3	2b	Uncertainty in Machine Learning	WBAIo54-05	5	WE, AST	Yes	CA, EW	M.A. Valdenegro Toro	TBD
2, 3	2b	Human Factors	WBAIo55-05	5	R, AST	Yes	CA, ET	C.L. Sibert	F. Cnossen
2, 3	2b	Structural Analysis of Language for Cognitive Modelling	WBAIo52-05	5	AST	Yes	CA	S.M. Jones	J.C. van Rij-Tange
2, 3	2b	Speech Technology	WBAIo73-05	5	WE, AST	Yes	CA, EW	S.D. Tokac	J.C. van Rij-Tange
Pre-approved Elective Course Units (organized by <u>Other</u> Degree Programme) *									
3	1a	Advanced Algorithms	WBCSo52-05	5	*	*	*	*	*
3	1a	Advanced Programming	WBCSo53-05	5	*	*	*	*	*
3	1a	Compiler Construction	WBCSo39-05	5	*	*	*	*	*
3	1a	Computational Complexity	WBCSo44-05	5	*	*	*	*	*
3	1a	C++ Fundamentals	WBCSo33-05	5	*	*	*	*	*
3	1a	Information Retrieval	WBCSo40-05	5	*	*	*	*	*
3	1a	Information Security	WBCSo04-05	5	*	*	*	*	*
3	1a	Philosophy of Mind: Body, Brain, Mind	FI202LBG	5	*	*	*	*	*
3	1a	Thinking and deciding	PSB3E-CP08	5	*	*	*	*	*
3	1b	Conversational Interfaces	LIXO29Bo5	5	*	*	*	*	*
3	1b	Functional Programming	WBCSo02-05	5	*	*	*	*	*
3	1b	Human Error	PSB3E-M06	5	*	*	*	*	*
3	1b	Introduction to Science Education	WBEC002-05	5	*	*	*	*	*
3	1b	IT Law for non-law students	RGARI70210	10	*	*	*	*	*

Year	Period	Course	Course code	EC	Assessment methods	Does (part of the) assessment have a formative function?	Test moment(s) (e.g. mid-term (MT), end-term (ET), continuous assessment (CA), exam week (EW), etc)	First examiner	Second examiner
3	1b	Logic Programming	LIX003B05	5	*	*	*	*	*
3	1b	Programming in C++	WBCS034-05	5	*	*	*	*	*
3	1b	Web Engineering	WBCS008-05	5	*	*	*	*	*
3	2a	Advanced Programming in C++	WBCS035-05	5	*	*	*	*	*
3	2a	Computational Grammar	LIX025B05	5	*	*	*	*	*
3	2a	Computer Graphics	WBCS019-05	5	*	*	*	*	*
3	2a	Introduction to Information Systems	WBCS021-05	5	*	*	*	*	*
3	2a	Learning and memory	PSB3E-CP09	5	*	*	*	*	*
3	2a	Machine Translation	LIX032B05	5	*	*	*	*	*
3	2a	Philosophy of the Natural Sciences	FI153LH	5	*	*	*	*	*
2, 3	2b	Languages and Machines	WBCS027-05	5	*	*	*	*	*

* Mandatory Course Unit or Pre-Approved Electives organized by other Degree Programme. For more information see the Assessment Plan of the Degree Programme organizing the course unit.

** The following examiners are allowed to supervise Bachelor's projects in the Artificial Intelligence Bachelor's Programme:

- drs. J.O. van Bijsterveld
- prof. dr. J.P. Borst
- J.D. Cardenas Cartagena, MSc.
- prof. dr. R. Carloni
- dr. Z.L. Christoff
- dr. F. Cnossen
- prof. dr. M.M. Cook
- R.F. Cunha, MSc.
- dr. M.A. Dhali
- prof. dr. J. Dibangoye
- prof. dr. D. Grossi
- prof. dr. H. Jaeger
- dr. S.M. Jones
- I.P. de Jong, MSc
- dr. S.K. Mehlhorn
- dr. S.H. Mohades Kasaei
- dr. S.M. van Netten
- dr. J.C. van Rij – Tange
- dr. M. Sabatelli
- dr. A.I. Sburlea

- dr. M.B. Schippers
- dr. J. Schoeffler
- prof. dr. L.R.B. Schomaker
- dr. C.L. Sibert
- prof. dr. N.A. Taatgen
- dr. T.M. Tashu
- dr. S.D. Tokaç
- J.D. Top, MSc.
- dr. M.A. Valdenegro Toro
- prof. dr. L.C. Verbrugge
- prof. dr. H.B. Verheij
- dr. P.A. Vogt
- dr. L.M. Vortmann
- dr. M.K. van Vugt
- dr. H.A. de Weerd
- dr. B.J. Wolf
- dr. M. Zullich

5. Relationship between course units and details of the learning outcomes

Please note in the table below the course units per block in the programme. Indicate which learning outcomes are assessed in which courses by adding an X in the relevant cell. **An X means that the learning outcome is explicitly assessed (not merely addressed) in the course.**

			Learning outcomes of the degree programme											
			1	2	3	4	5	6	7	8	9	10	11	12
Period	Course	Course code	Year 1 – compulsory courses											
1a	Introduction to Artificial Intelligence	WBAIo04-05	X	X										
1a	Autonomous Systems	WBAIo02-05				X								
1a-1b	Imperative Programming (for AI)	WBAIo03-05										X		
1a-1b	Calculus for Artificial Intelligence	WBAIo48-05									X			
1b	Basic Scientific Skills	WBAIo10-05								X			X	X
1b	Introduction to Logic	WBAIo12-05	X								X			
2a	Algorithms and Data Structures	WBAIo18-05										X		
2a	General Linguistics	WBAIo22-05	X				X							
2a	Cognitive Psychology	WBAIo21-05								X				
2b	Fundamental Artificial Intelligence	WBAIo63-05	X								X	X		
2b	Introduction to the Brain	WBAIo26-05			X		X			X			X	
2b	Linear Algebra and Multivariable Calculus	WBAIo50-05									X			
Period	Course	Course code	Year 2 compulsory courses											
1a	Object-Oriented Programming (for AI)	WBAIo45-05										X		
1a	Knowledge and Agent Systems	WBAIo57-05	X					X				X		
1a	Statistics	WBAIo49-05									X		X	
1b	Architectures of Intelligence	WBAIo09-05			X					X			X	
1b	Introduction to Machine Learning	WBAIo56-05		X						X	X	X		
1b	Signals and Systems	WBAIo16-05									X			
2a	Advanced Logic	WBAIo17-05	X								X			
2a	Philosophy of AI and Cognition	FI203AI							X					
2a	Natural Language Processing	WBAIo59-05		X			X					X		
2b	Data Science	WBAIo64-05								X	X		X	
2b	Applied Machine Learning	WBAIo65-05		X								X		X
Period	Course	Course code	Year 3 compulsory courses											
2a	Ethics in Artificial Intelligence	WBAIo40-05							X	X			X	X
2a-2b	Bachelor's Project	WBAIo91-15	*	*	*	*	*	*	*	*	*	*	X	X

			Learning outcomes of the degree programme											
			1	2	3	4	5	6	7	8	9	10	11	12
(1a-1b)														
Period	Course	Course code	Practicals											
1a	Cognitive Ergonomics Practical	WBAIo25-05			X					X			X	
1a	Machine Learning for Industry Practical	WBAIo70-05		X								X		X
1b	Knowledge Technology practical	WBAIo14-05	X					X				X	X	
1b	Language Technology Practical	WBAIo27-05	X				X				X			
1b	Reinforcement Learning Practical	WBAIo15-05		X						X			X	
2a	Cognitive Modelling Practical	WBAIo20-05			X					X			X	
2a	Social Robotics Practical	WBAIo62-05				X	X					X	X	
2b	Agent Technology Practical	WBAIo46-05						X				X	X	
2b	Robotics Practical	WBAIo66-05		X		X						X	X	
Period	Course	Course code	Electives (organized by Own Degree Programme)											
1a	Neural Networks	WBAIo28-05		X						X	X	X		
1a	Introduction to Robotics	WBAIo67-05				X				X				
1a	Large Language Models	WBAIo68-05		X			X					X	X	
1a	Reinforcement Learning	WBAIo61-05		X								X	X	
1b	Domain Analysis	WBAIo58-05											X	
1b	Hybrid Intelligence	WBAIo69-05		X	X			X		X			X	
1b	Social Robotics	WBAIo71-05				X	X			X			X	
2a	Human Language Learning	WBAIo72-05					X			X				
2b	Uncertainty in Machine Learning	WBAIo54-05		X						X	X	X		
2b	Human Factors	WBAIo55-05			X					X				
2b	Structural Analysis of Language for Cognitive Modelling	WBAIo52-05					X							
2b	Speech Technology	WBAIo73-05					X			X				
Period	Course	Course code	Pre-approved Electives (organized by Other Degree Programme)											
1a	Advanced Algorithms	WBCSo52-05										X		
1a	Advanced Programming	WBCSo53-05										X	X	
1a	Compiler Construction	WBCSo39-05										X		
1a	Computational Complexity	WBCSo44-05	X								X			
1a	C++ Fundamentals	WBCSo33-05										X		
1a	Information Retrieval	WBCSo40-05						X				X	X	

			Learning outcomes of the degree programme											
			1	2	3	4	5	6	7	8	9	10	11	12
1a	Information Security	WBCS004-05										X		
1a	Philosophy of Mind: Body, Brain, Mind	FI202LBG							X	X				
1a	Thinking and deciding	PSB3E-CP08								X			X	X
1b	Conversational Interfaces	LIX029B05					X					X		
1b	Functional Programming	WBCS002-05									X	X		
1b	Human Error	PSB3E-M06							X	X				
1b	Introduction to Science Education	WBEC002-05											X	
1b	IT Law for non-law students	RGARI70210											X	
1b	Logic Programming	LIX003B05	X					X			X	X		
1b	Programming in C++	WBCS034-05										X		
1b	Web Engineering	WBCS008-05										X	X	
2a	Advanced Programming in C++	WBCS035-05										X		
2a	Computational Grammar	LIX025B05					X				X			
2a	Computer Graphics	WBCS019-05									X	X		
2a	Introduction to Information Systems	WBCS021-05									X	X		
2a	Learning and memory	PSB3E-CP09			X				X					
2a	Machine Translation	LIX032B05					X						X	
2a	Philosophy of the Natural Sciences	FI153LH							X	X			X	
2b	Languages and Machines	WBCS027-05	X				X	X			X			

* The learning outcomes in the Bachelor's Project differ depending on the type of project.