Appendices Bachelor's degree programme Artificial Intelligence
2022 – 2023

Appendix I   Learning outcomes of the degree programme (Article 3.1.1)

The bachelor demonstrates knowledge, understanding, and the ability to evaluate, analyse and interpret relevant data in the field of

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.
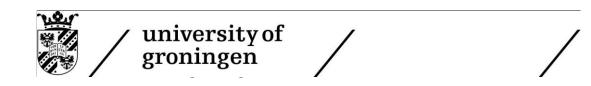
The bachelor has knowledge and understanding of

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.

The bachelor has relevant knowledge and ability

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.

The bachelor has the ability

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.
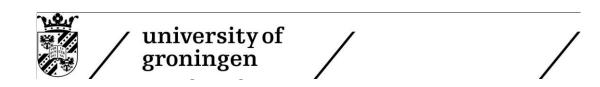
Appendix II   Majors and Minors of the degree programme (Article 3.7.4)

The degree programme has the following **Major**:
– Artificial Intelligence

The degree programme does not offer any **Minors**.

Appendix III   Course units in the propaedeutic phase
(**List of Course Units; Article 4.1.1**)
(**Compulsory Order of Examinations; Article 9.3**)

The propaedeutic phase comprises a number of mandatory course units, each with a student workload of 5 ECTS credit points, listed in the table below. The modes of assessment and whether a course unit includes a practical element are described in the assessment plan of the BSc Artificial Intelligence of the respective academic year.

Mandatory Courses (60 ECTS credit points)
Algorithms and Data Structures [**WBAI018-05**]
Artificial Intelligence 1 [**WBAI023-05**]
Autonomous Systems [**WBAI002-05**]
Basic Scientific Skills [**WBAI010-05**]
Calculus for Artificial Intelligence [**WBAI048-05**]
Cognitive Psychology [**WBAI021-05**]
General Linguistics [**WBAI022-05**]
Imperative Programming [**WBAI003-05**]
Introduction to Artificial Intelligence [**WBAI004-05**]
Introduction to Logic [**WBAI012-05**]
Introduction to the Brain [**WBAI026-05**]
Linear Algebra and Multivariable Calculus [**WBAI050-05**]

There is no formal order of examinations for any of the course units in the propaedeutic phase.

Introduction to Logic (MA + Guests) [**WBAI013-05**] is an elective course, equivalent to Introduction to Logic [**WBAI012-05**], offered to students from the (Applied) Mathematics programme, and other external students.

Appendix IV   Course units in the post-propaedeutic phase
(List of course units; Article 7.1.1)
(Compulsory order of examinations; Article 9.3)

The post-propaedeutic phase comprises a number of mandatory course units, each with a student workload of 5 ECTS credit points, unless stated otherwise, listed in the table below. The different modes of assessment and whether a course unit includes a practical element are described in the assessment plan of the BSc Artificial Intelligence of the respective academic year.

Mandatory Courses (60 ECTS credit points)
Advanced Logic [**WBAI017-05**]
Architectures of Intelligence [**WBAI009-05**]
Artificial Intelligence 2 [**WBAI001-05**]
Data Analytics and Communication [**WBAI011-05**]
Ethics in Artificial Intelligence [**WBAI040-05**]
Knowledge and Agent Technology [**WBAI006-05**]
Language and Speech Technology [**WBAI007-05**]
Neural Networks [**WBAI028-05**]
Object-Oriented Programming [**WBAI045-05**]
Philosophy of AI and Cognition [**FI203AI**]
Signals and Systems [**WBAI016-05**]
Statistics [**WBAI049-05**]
Practical Course Units (choose 15 ECTS credit points [a])
Agent Technology Practical [**WBAI046-05**]
Cognitive Ergonomics Practical [**WBAI025-05**]
Cognitive Modelling Practical [**WBAI020-05**]
Knowledge Technology Practical [**WBAI014-05**]
Language Technology Practical [**WBAI027-05**]
Reinforcement Learning Practical [**WBAI015-05**]
Robotics Practical 1 [**WBAI029-05**]
Robotics Practical 2 [**WBAI030-05**]
Bachelor's Project (15 ECTS credit points)
Bachelor's Project [b] [**WBAI901-15**]

a) *It is possible to take more than 15 ECTS credit points in practical course units, if students use their elective space for the additional practical course units.*
b) *This course yields 15 ECTS credit points.*

In addition to the mandatory (fixed) programme, the post-propaedeutic phase consists of 30 ECTS credit points in elective course units. 15 of these credit points will have to be chosen from a list of pre-approved electives. The other 15 credit points can either be from the list of pre-approved electives, or a free choice elective, provided the Board of Examiners has approved this choice. The post-propaedeutic phase comprises the following pre-approved electives (each with a student workload of 5 ECTS credit points, unless stated otherwise):

Students can choose from the following list of course units without needing approval of the Board of Examiners:
(please refer to the Teaching and Examination Regulations and curriculum assessment plans of the relevant degree programmes for modes of assessment)

- Advanced Programming in C++ [**WBCS035-05**]
- C++ Fundamentals [**WBCS033-05**]
- Cognition and Attention [**PSB3E-CP02**]
- Compiler Construction [**WBCS039-05**]
- Computational Grammar [**LIX025B05**]
- Computer Graphics [**WBCS019-05**]
- Functional Programming [**WBCS002-05**]
- Human Error [**PSB3E-M06**]
- Information Retrieval [**WBCS040-05**]
- Information Security [**WBCS004-05**]
- Introduction to Information Systems [**WBCS021-05**]
- Introduction to Machine Learning [d] [**WBCS032-05**]
- Introduction to Science Education [c] [**WBEC002-05**]
- IT Law for non-law Students [a,c] [**RGARI70210**]
- Learning: Theory and Practice [**PSB3E-M14**]
- Logic Programming [**LIX003B05**]
- Neurophysics (Physics for Artificial Intelligence) [**WBAI008-05**]
- Parallel Computing [**WBCS029-05**]
- Philosophy of Mind: Body, Brain, Mind [b,c] [**FI202LBG**]
- Philosophy of the Natural Sciences: Physics and Metaphysics [**FI153LH**]
- Problem Analysis and Software Design [**WBCS012-05**]
- Programming in C++ [**WBCS034-05**]
- Structural Analysis of Language for Cognitive Modelling [**WBAI052-05**]

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a) This course unit yields 10 ECTS credit points.
b) This course unit yields 7 ECTS credit points.
c) This course unit is taught in Dutch.
d) Students who have passed Introduction to Intelligent Systems [INBINTS-08] cannot take this course.

A student *can* take additional practical course units from the list of practical course units in the mandatory course units list without the formal approval of the Board of Examiners.

As stated in Article 8.2.2, students are free to take any University Minor as a broadening module. Students will not need explicit permission from the Board of Examiners, similar to the pre-approved course units and practical course units. An exception to this universal approval is the *Data Wise: Data Science in Society* Minor organized by the Faculty of Behavioural and Social Sciences, as the contents significantly overlap with the Artificial Intelligence BSc programme. It is also not possible to include a course from a University Minor if an equivalent or similar course is already taught in the Artificial Intelligence BSc programme.

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).

Compulsory order of examinations (Article 9.3)

The examinations for the course units listed below may not be taken before the examinations for the associated course units have been passed:

Course Unit Name	Entry Requirements [a]
Advanced Logic [**WBAI017-05**]	– Introduction to Logic [**WBAI012-05** or **WBAI013-05**]
Bachelor's Project [**WBAI901-15**]	– At least 135 ECTS credit points from the AI bachelor's programme – Data Analytics and Communication [**WBAI011-05**] – Statistics [**WBAI049-05**] – Students must have successfully completed all propaedeutic course units
Cognitive Ergonomics Practical [**WBAI025-05**]	– Cognitive Psychology [**WBAI021-05**]
Cognitive Modelling Practical [**WBAI020-05**]	– Architectures of Intelligence [**WBAI009-05**] – Cognitive Psychology [**WBAI021-05**] – Statistics [**WBAI049-05**]
Data Analytics and Communication [**WBAI01105**]	– Statistics [**WBAI049-05**]
Language and Speech Technology [**WBAI007-05**]	– Calculus for AI [**WBAI048-05**] – General Linguistics [**WBAI022-05**]
Language Technology Practical [**WBAI027-05**]	– Language and Speech Technology [**WBAI007-05**]
Neural Networks for Artificial Intelligence [**WBAI028-05**]	– Calculus for AI [**WBAI048-05**] – Linear Algebra and Multivariable Calculus [**WBAI050-05**]
Neurophysics (Physics for Artificial Intelligence) [**WBAI008-05**]	– Calculus for AI [**WBAI048-05**] – Linear Algebra and Multivariable Calculus [**WBAI050-05**] – Signals and Systems [**WBAI016-05**]

Reinforcement Learning Practical [**WBAI015-05**]	– Autonomous Systems [**WBAI002-05**] – Imperative Programming [**WBAI003-05**]
Robotics Practical 1 [**WBAI029-05**]	– Calculus for AI [**WBAI048-05**] – Linear Algebra and Multivariable Calculus [**WBAI050-05**]
Robotics Practical 2 [**WBAI030-05**]	– Calculus for AI [**WBAI048-05**] – Linear Algebra and Multivariable Calculus [**WBAI050-05**]
Signals and Systems [**WBAI016-05**]	– Calculus for AI [**WBAI048-05**] – Linear Algebra and Multivariable Calculus [**WBAI050-05**]
Structural Analysis of Language for Cognitive Modelling [**WBAI052-05**]	– General Linguistics [**WBAI022-05**]

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 V   Admission to the post-propaedeutic phase (Article 6.1.1)

The following candidates will be admitted to the post-propaedeutic phase:
Students who have been issued a positive study advice from the degree programme in question

In other cases, the Admissions Board (in consultation with the Board of Examiners of the BSc programme in question) will decide whether it is possible for a student to be admitted to the post-propaedeutic phase of the programme.

Appendix VI   Contact hours propaedeutic and post-propaedeutic phase
(Article 3.6)

Contact Hours Propaedeutic Phase	
Type of Contact Hour	**Contact Hours per Year (approx. 682)**
Lectures	Approx. 270
Tutorial	Approx. 180
Practicals	Approx. 90
Tutoring / Mentor Hours	Approx. 10
Supervision during an internship	0
Final Examinations and Re-examinations	Approx. 60
Mid-term Examinations	Approx. 15
Career Support (FSE General)	Approx. 12
Miscellaneous Sessions (e.g. Q&A)	Approx. 30

Contact Hours Post-propaedeutic Phase	
Type of Contact Hour	**Contact Hours per Year (approx. 1251.5)**
Lectures	Approx. 520
Tutorial	Approx. 100
Practicals	Approx. 460
Tutoring / Mentor Hours	0
Supervision during an internship or project	Approx 7.5
Final Examinations and Re-examinations	Approx. 100
Mid-term Examinations	Approx. 0
Career Support (FSE General)	Approx. 24
Miscellaneous Sessions (e.g. Q&A)	Approx. 40

Appendix VII   Additional requirements Open degree programmes
(Article 7.3)

Students are permitted to obtain a diploma in the Artificial Intelligence BSc 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 a BSc Project, to guarantee they are able to function as a BSc 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 BSc Framework of Reference of the Netherlands.

Appendix VIII Transitional provisions (Article 12.1)

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 2021–2022 or before:

There are no transitional provisions for the year 2021–2022.

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**
Constraint-based Grammatical Analysis	WBAI047-05	5	-	Structural Analysis of Language for Cognitive Modelling	WBAI052-05	5
Linear Algebra and Multivariable Calculus	WBCS037-05	5	-	Linear Algebra and Multivariable Calculus	WBAI050-05	5
Object-Oriented Programming	WBCS028-05	5		Object-Oriented Programming	WBAI045-05	5
Statistics	WBCS038-05	5	-	Statistics	WBAI049-05	5

In addition, the following provisions apply:
Students are allowed to take Neurophysics (Physics for Artificial Intelligence) [**WBAI008-05**] instead of Ethics in Artificial Intelligence [**WBAI040-05**] as part of their mandatory programme. If they choose to do so, Ethics in Artificial Intelligence [**WBAI040-05**] may be used as a pre-approved elective option instead

In addition, Robotics Practical 3 [**WBAI051-05**] is considered a valid elective under the Artificial Intelligence BSc programme.

Students who started in 2019–2020 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**
Autonomous Systems Practical	KIB.PAS05	5	-	Robotics Practical 1	WBAI029-05	5
Autonomous Systems Practical Extension	WBAI14001	5	-	Robotics Practical 2	WBAI030-05	5
Philosophy of Cognitive Science	FI053CW	5	-	Philosophy of AI and Cognition	FI203AI	5

Additionally, the table below shows 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 BSc diploma: one does not have to take the version that is listed in the current Teaching and Examination regulations, and one 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 the own degree programme.

Course Name	Old Course Code	New Course Code	ECTS Credit Points
Organized by Artificial Intelligence (BSc)			
Advanced Logic	KIB.VL03	WBAI017-05	5
Algorithms and Data Structures (AI)	WPAI18002	WBAI018-05	5
Architectures of Intelligence	KIB.AVI03	WBAI009-05	5
Artificial Intelligence 1	KIB.KI103	WBAI023-05	5
Artificial Intelligence 2	KIB.KI203	WBAI001-05	5

Autonomous Systems	KIB.AS03	WBAI002-05	5
Bachelor's Project	KIB.PROJ03	WBAI901-10	10
Basic Scientific Skills	KIB.WBV06	WBAI010-05	5
Cognitive Ergonomics Practical	WBAI19002	WBAI025-05	5
Cognitive Modelling Practical	WBAI18002	WBAI020-05	5
Cognitive Psychology	KIB.CP06	WBAI021-05	5
Data Analytics and Communication	WBAI17001	WBAI011-05	5
General Linguistics	KIB.ATW03	WBAI022-05	5
Imperative Programming	WPAI19001	WBAI003-05	5
Introduction to Artificial Intelligence	KIB.ORKI03	WBAI004-05	5
Introduction to Logic (AI)	WPAI14001	WBAI012-05	5
Introduction to the Brain	WPAI18001	WBAI026-05	5
Knowledge and Agent Technology	KIB.KT03	WBAI006-05	5
Knowledge Technology Practical	KIB.PKT10	WBAI014-05	5
Language and Speech Technology	KIB.TST03	WBAI007-05	5
Language Technology Practical	KIB.PTT07	WBAI027-05	5
Neural Networks AI	KIB.NNKI03	WBAI028-05	5
Neurophysics (Physics for Artificial Intelligence)	KIB.NF07	WBAI008-05	5
Reinforcement Learning Practical	WBAI19001	WBAI015-05	5
Signals and Systems	KIB.SENS12	WBAI016-05	5
Organized by Other Programmes (Mandatory)			
Calculus for Artificial Intelligence	WPMA14003	WBAI048-05	5
Linear Algebra and Multivariable Calculus	WPMA14005	WBCS037-05	5
Object-Oriented Programming	INBOGP-08	WBCS028-05	5
Statistics	WISTAKI-07	WBCS038-05	5
Organized by Other Programmes (Preapproved Elective)			
Computer Graphics	INBCG-08	WBCS019-05	5
Functional Programming	INBFP-08	WBCS002-05	5
Information Security	INBSEC-08	WBCS004-05	5
Introduction to Information Systems	INBIIS-08	WBCS021-05	5
Parallel Computing	INBPAR-08	WBCS029-05	5
Problem Analysis and Software Design	WBCS16000	WBCS012-05	5
Philosophy of Science	FIWET090	FIWET180	5

Self-organization	WBLS19046	WBBY069-05	5

Students who started in 2018–2019 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**
Cognitive Science Practical	KIB.PRCS08	5	-	Cognitive Modelling Practical	WBAI18002	5

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.