Appendices Master's degree programme Computational Cognitive Science 2023 – 2024
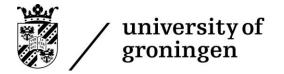
Appendix I   Learning outcomes of the degree programme (Article 3.1)

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 three of the research areas below. In one research area of Computational Cognitive Science the master has specialised knowledge at an advanced level.

    a. Computational theories and models of cognitive processes
    b. Multivariate statistics
    c. Cognitive ergonomics
    d. Application of formal models of cognition in human-computer interaction and education
    e. Linguistics and language technology
    f. Cognitive neuroscience

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 Computational Cognitive Science.

4. The master demonstrates relevant knowledge and the ability to use programming languages used in the field of Computational Cognitive Science.

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 to communicate about this both individually and in a group, both orally 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 with a high degree of autonomy, and is able to understand the scientific developments within the field of Computational Cognitive Science.
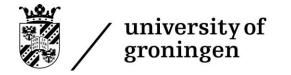
Appendix II   Tracks/Specializations of the degree programme (Article 3.6)

The Computational Cognitive Science MSc Programme has no tracks.

The programme has three 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)   Cognitive Engineering
b)   Cognitive Language Modelling
c)   Cognitive Modelling and the Brain

Appendix III   Content of the degree programme (Article 3.8)

The master programme consists of mandatory courses (85 ECTS), specialization courses (20 ECTS) and elective courses (15 ECTS, see appendix IV). Course details including modes of instruction, and modes of assessment are described in OCASYS.

Mandatory course units

Course code	Course unit name	ECTS
WMCC005-05	Advanced Statistical Modelling	5
WMCC006-05	Cognitive Modelling: Basic Principles and Methods	5
WMCC901-45 or WMCC901-30 plus WMCC902-15	Final Research Project (45 ECTS) or Final Research Project (30 ECTS) plus Internship (15 ECTS)	45
WMCC012-15	First-Year Research Project	15
WMCC002-05	Formal Models of Cognition	5
WMCC017-05	Machine Learning for Computational Cognitive Science	5
WMCC015-05	Methods in Computational Cognitive Science	5

In addition to the general mandatory programme, students have to take the mandatory course units of one of the three programme specializations.

Specializations and their mandatory course units

Cognitive Engineering

Course code	Course name	ECTS
WMCC007-05	Applied Cognitive Engineering	5
WMCC001-05	Cognitive Engineering	5
WMCC011-05	Neuro-ergonomics	5
WMCC004-05	User Models	5

Cognitive Language Modelling

Course code	Course name	ECTS
WMCC009-05	Computational Simulations of Language	5
WMCC003-05	Language Modelling	5
LIX025M05	Language Technology Project	5
WMCC014-05	Models of Human-Syntax Processing	5

Cognitive Modelling and the Brain

Course code	Course name	ECTS
WMCC008-05	Cognitive Modelling: Complex Behaviour	5
WMCC010-05	Computational Cognitive Neuroscience	5
WMCC016-05	Non-Invasive Brain-Computer Interfaces	5
WMCC004-05	User Models	5

Appendix IV Elective course units
(Article 3.9.1)

In addition to the general mandatory course units and the specialization mandatory course units, the programme comprises elective course units (15 ECTS). Students can either choose pre-approved electives or free electives. For free electives they need to request the formal approval of the Board of Examiners.
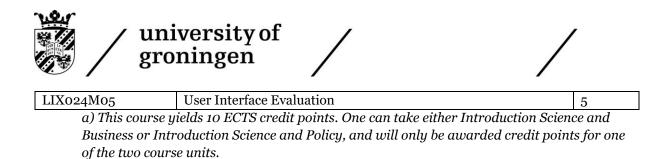
Pre-approved elective course units from AI/CCS

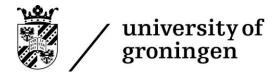| Course code	Course unit name	ECTS
WMCC007-05	Applied Cognitive Engineering	5
WMAI001-05	Arguing Agents	5
WMCC001-05	Cognitive Engineering	5
WMCC008-05	Cognitive Modelling: Complex Behaviour	5
WMAI003-05	Cognitive Robotics	5
WMCC010-05	Computational Cognitive Neuroscience	5
WMCC009-05	Computational Simulations of Language	5
WMAI016-05	Computational Social Choice	5
WMAI017-05	Deep Learning	5
WMAI024-05	Deep Reinforcement Learning	5
WMAI004-05	Design of Multi-Agent Systems	5
WMAI019-05	Handwriting Recognition	5
WMCC003-05	Language Modelling	5
WMAI020-05	Logical Aspects of Multi-Agent Systems	5
WMCC014-05	Models of Human-Syntax Processing	5
WMCC011-05	Neuro-ergonomics	5
WMCC016-05	Non-Invasive Brain-Computer Interfaces	5
WMAI011-05	Robotics for Artificial Intelligence	5
WMCC004-05	User Models	5

Pre-approved elective course units from other degree programmes

Course code	Course unit name	ECTS
PSMCB-4	Applied Cognitive Neuroscience	5
WMBC002-05	Auditory and Visual Perception	5
WMCS032-05	Cloud Computing and Cloud-Based Applications	5
LIX021M05	Computational Semantics	5
LIX022M05	Computer-Mediated Communication	5
LTR024M05	Corpus Linguistics	5
WMSE001-10	Introduction Science and Business [a]	10
WMSE002-10	Introduction Science and Policy [a]	10
WMCS002-05	Introduction to Data Science	5
LIX025M05	Language Technology Project	5
LIX001M05	Natural Language Processing	5
FI184FR	Philosophy of Neuroscience	5
WMCS018-05	Scientific Visualization	5
LIX002M05	Semantic Web Technology	5
WMEC006-05	Skills in Science Communication	5
PSMCB-3	Trends in Cognitive Neuroscience	5

| LIX024M05 | User Interface Evaluation | 5 |

a) This course yields 10 ECTS credit points. One 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.

Formal approval of the Board of Examiners is required, in case and before a student would like to choose electives which are not on the above lists of pre-approved electives.

Appendix V   Entry requirements and compulsory order of examinations
(Article 4.4)

Course unit name and code	Entry requirements
Applied Cognitive Engineering [WMCC007-05]	Cognitive Engineering [WMCC001-05]
Cognitive Modelling: Complex Behaviour [WMCC008-05]	Cognitive Modelling: Basic Principles and Methods [WMCC006-05] [a]
Final Research Project [WMCC901-45 or WMCC901-30 plus WMCC902-15]	At least 60 ECTS credit points from the master's programme Advanced Statistical Modelling [WMCC00505] Cognitive Modelling: Basic Principles and Methods [WMCC006-05] First-Year Research Project [WMCC012-05] Formal Models of Cognition [WMCC002-05] Machine Learning for CCS [WMCC017-05] Methods in CCS [WMCC015-05] Completion of the specialization relevant to the final research project
Models of Human-Syntax Processing [WMCC014-05]	Cognitive Modelling: Basic Principles and Methods [WMCC006-05]
User Models [WMCC004-05]	Cognitive Modelling: Basic Principles and Methods [WMCC006-05]

a) *Students who passed Architectures of Intelligence [WBAI009-05] in the BSc AI are exempted from this rule.*

Models of Human-Syntax Processing [WMCC014-05] has General Linguistics [WBAI022-05] as a strongly recommended course unit. Students who did not take the BSc Artificial Intelligence are advised to (have) take(n) a comparable course unit.

Appendix VI   Admission to the degree programme (Article 2.1A)

Holders of a certificate from the following Bachelor's degree programmes are considered to have sufficient knowledge and skills and will be admitted to the Master's degree programme in Computational Cognitive Science on that basis:
- Artificial Intelligence of the University of Groningen or other Dutch university
- Information Science of the University of Groningen

Appendix VII Transitional provisions (Article 7.1)

To prevent negative effects of curriculum changes on students who were already registered in the programme before these changes were made, the following transitional provisions apply. The provisions are listed in reverse-chronological order. General provisions are described through text. Course units that are a direct replacement for discontinued course units are listed in table format.

Students who started in 2022-2023 or before:

From 23-24 onwards, Machine Learning for CCS (WMCC017-05) is part of the mandatory programme. Students who started in 22-23 or before do not have to include this course in their mandatory programme.

From 23-24 onwards, the course unit Models of Human-Syntax Processing (WMCC014-05) is added to the mandatory course package of the specialization Cognitive Language Modelling. Students who started in 22-23 or before, and are pursuing this specialization, do not have to include this course unit in their mandatory course package.

In 22-23, the course Computational Simulations of Language (WMCC009-05) could not be offered. Students who started in 22-23, and are pursuing the specialization Cognitive Language Modelling, are allowed to include Models of Human Syntax Processing (WMCC014-05) instead of Computational Simulations of Language, in their mandatory course package.

From 23-24 onwards, the specializations Cognitive Modelling and Computational Cognitive Neuroscience are replaced by the specialization Cognitive Modelling and the Brain.

Specialization	Course code	Course unit name	ECTS
Cognitive Modelling	WMCC008-05 WMCC010-05 WMCC004-05	Cognitive Modelling: Complex Behaviour Computational Cognitive Neuroscience User Models	5 5 5
Computational Cognitive Neuroscience	WMCC008-05 WMCC010-05 WMAI010-05	Cognitive Modelling: Complex Behaviour Computational Cognitive Neuroscience Machine Learning (for AI)	5 5 5
From 2023-2024 onwards replaced by			
Cognitive Modelling and the Brain	WMCC008-05 WMCC010-05 WMCC016-05 WMCC004-05	Cognitive Modelling: Complex Behaviour Computational Cognitive Neuroscience Non-Invasive Brain-Computer Interfaces User Models	5 5 5 5

Students who started in 22-23 or before are allowed to include three instead of four courses in their mandatory course package for the specialization Cognitive Modelling and the Brain, consisting of Cognitive Modelling: Complex Behaviour, Computational Cognitive Neuroscience, and either User Models or Machine Learning for AI or Non-Invasive Brain-Computer Interfaces or Machine Learning for CCS (WMCC017-05).

Students who started in 2021–2022 or before:

Students do not have to include Methods in CCS [WMCC015-05] in their mandatory programme. They can still include it as a pre-approved elective course unit.

Students who started in 2020–2021 or before:

Discontinued course unit			Replacement course unit		
Course code	Course name	ECTS	Course code	Course name	ECTS
WMCC013-05	Non-derivational Theories of Syntax	5	WMCC014-05	Models of Human-Syntax Processing	5
WMCS011-05	Pattern Recognition	5	WMAI021-05	Pattern Recognition	5

Students who were previously part of the Human-Machine Communication MSc need not request any transitional provisions, since the only formal change to the master's programme is the name. They will graduate under the 'Computational Cognitive Science' name.

Cases not listed in the Teaching and Examination Regulations, through either the current curriculum or the transitional provisions, are to be treated by the Board of Examiners of the degree programme.

Appendix VIII Additional requirements Open degree programmes
(Article 3.10)

Students are permitted to obtain a diploma in the Computational Cognitive Science MSc programme without fully fitting the curriculum set out in Appendix III and Appendix IV. This can only happen in consultation with and after approval of the Board of Examiners of the degree programme. Students are required to finish a MSc Project, to guarantee they are able to function as a 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.