

Assessment Plan for the Master's Programme in Computational Cognitive Science (2023 – 2024)

Introduction

This assessment plan is a description of the modes of assessment and review processes of all the course units that are part of the mandatory Computational Cognitive Science Master's degree programme in the academic year 2023-2024. This programme was previously known as Human-Machine Communication. This document is based on the assessment policy of the Faculty of Science and Engineering, as described in the manual for quality assurance (Chapter 6: Assessment Policy, 2018-2019).

The assessment plan formally consists of the following parts:

1. the goals of the degree programme;
2. the learning outcomes of the degree programme;
3. a description of the course units as included in programme-specific attachments of the Teaching- and Examination Regulations of 2023-2024;
4. a course description per course unit (listed in Ocasys). This course description should at least contain the following elements:
 - The course goals;
 - A description of the course contents;
 - The course lecturers;
 - The mode(s) of assessment of a course unit and the way in which they contribute to the final course grade;
 - The mode(s) of instruction of a course unit
5. a detailed overview of the examiners and mode(s) of assessment per course unit. The course units in this overview are based on the curricula of each respective study year corresponding to the Teaching- and Examination Regulations of a nominal student. The relevant sections of these Teaching- and Examination Regulations and the curricula of the respective years have been approved by the programme committee of the Computational Cognitive Science (MSc.) degree programme.
6. a matrix describing the relationship between the course units and the (specification of the) learning outcomes.

Parts 3 and 4 have not been included in this document. A description of the course units is, as mentioned, located in the programme-specific attachments of the Teaching- and Examination Regulations of 2023-2024. The course description per course unit is listed on [Ocasys](#).

In addition to the required components, these assessment plans also contain a full overview of the examiners at Computational Cognitive Science (MSc.) and an overview of the course units that are not part of the Computational Cognitive Science (MSc.) programme but fall under their ownership nevertheless. This overview mostly includes courses that use the exact same assessment as in Computational Cognitive Science (and are organized by the Artificial Intelligence base unit), but have been split into two (or more) courses purely for practical reasons.

1. Goals of the Degree Programme

The goal of the Computational Cognitive Science (MSc.) programme is to deliver critical, independent and academic individuals, who can professionally function in the fields of Artificial Intelligence and Cognitive Science. Computational Cognitive Science is interdisciplinary, as it not only includes Artificial Intelligence and Psychology, but is also strictly tied to the fields of Computer Science, Linguistics, and Neuroscience. The field has developed its own themes and methods based on these other fields of science, such as Cognitive Modelling and Language Technology, and is tied to the field of Cognitive Engineering.

Graduates of the Computational Cognitive Science programme are expected to have a basic understanding of the (8) key areas of Artificial Intelligence, as defined in the nationwide Frame of Reference (by the KION – Kunstmatige Intelligentie Opleidingen Nederland). In addition to knowledge of these key areas, students are expected to have advanced level knowledge in at least three and specialist level knowledge in at least one of these (8) key areas:

- Cognitive Science
- Computational Linguistics
- Context of Artificial Intelligence (History, Philosophy, Ethics)
- Intelligent Autonomous Agents and Multi-Agent Systems
- Interaction (Perception, Human-Computer Interaction, Communication)
- Knowledge Representation and Reasoning
- Machine Learning
- Problem Solving (Search, Decision Making, Optimization)

The CCS Master's programme covers all of the basic areas and skills, and covers most of the side-modules that are (directly) connected to Artificial Intelligence and Cognitive Science. Since this field is an intersection of Artificial Intelligence and Psychology, it covers a broad selection of topics, which means that we attract a very diverse group of students. Despite this diverse group of students, there are some common denominators in the group of CCS graduates (in addition to the aforementioned knowledge of key areas): students are critical, not afraid to ask questions, open, analytical and interdisciplinary. Students should be able to develop their interests and, thus, are not expected to master all of the connected areas and skills at the end of their degree programme: there is room for students to build their own profile through the choice of a set of pre-approved electives.

This view on education and the key areas are implemented throughout the courses offered in the programme. The CCS (MSc.) courses stick to a format (lecture, practical, tutorial, seminar, etc.) that best fits the courses in question. These courses are then assessed through varied means, once again tailored to fit the assessment that is hypothesized to be the best for the subject matter at hand. The CCS (MSc.) programme has a very strong focus on academic skills, but tends to assess courses in multiple ways, to ascertain the final grade is not dominated by a specific mode of assessment: students will have to master all the relevant skills before they can pass a course unit. The final grade directly corresponds to the student's level of mastery.

Computational Cognitive Science graduates generally have a profession as:

- An interface designer / analyst, or language- and speech technologist in usability engineering
- A model builder that develops cognitive models to simulate human intelligence for use in various applications
- A consultant in the fields related to Computational Cognitive Science
- A researcher in the field of Artificial Intelligence, Cognitive Science, Cognitive Ergonomics, Cognitive Modelling, Computational Linguistics, etc.

2. Learning Outcomes of the Degree Programme

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 three of the research areas below. In one research area of Computational Cognitive Science the master has specialized knowledge at a forefront 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
 - g. Machine Learning
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 Computational Cognitive Science.
4. The master demonstrates relevant knowledge and the ability to use programming languages used in Computational Cognitive Science.
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 Computational Cognitive Science.

3. Overview of Examiners and Modes of Assessment per Course Unit

The Computational Cognitive Science (MSc.) programme has multiple modes of assessment. Each of these has been given an abbreviation for layout purposes. An overview of these modes is listed below:

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

The table below makes a distinction between courses that are included in the mandatory programme, courses that are included in any of the specializations of the programme and courses that are offered by the own programme, but are classified as a pre-approved elective.

Course Unit	ECTS	Practical	Examiners	Mode(s) of Assessment
Course Units in the Mandatory Programme				
Advanced Statistical Modelling (WMCC005-05)	5	Yes	dr. J.C. van Rij – Tange, <i>vacancy</i>	AST
Cognitive Modeling: Basic Principles and Methods (WMCC006-05)	5	Yes	prof. dr. N.A. Taatgen, dr. W. Kruijne	AST, PR, R
First-year Research Project (WMCC012-15) **	15	No	Project Supervisors (see list of examiners)	PR, P, R
Formal Models of Cognition (WMCC002-05)	5	Yes	dr. C.L. Sibert, dr. M.K. van Vugt	AST
Machine Learning for CCS (WMCC017-05)	5	Yes	dr. A.I. Sburlea, <i>vacancy</i>	t.b.d.
Methods in CCS (WMCC015-05)	5	Yes	dr. J.P. Borst, dr. A.I. Sburlea	P, R
Final Research Project (WMCC901-30 / WMCC901-45) ***	30 / 45	No	Project Supervisors (see list of examiners)	PR, P, R
Internship (WMCC902-15) ***	15	No	Internship Supervisors (see list of examiners)	R
Course Units in the Specialization(s)				
Applied Cognitive Engineering (WMCC007-05)	5	Yes	dr. F. Cnossen, dr. M.B. Schippers	AST, P, R
Cognitive Engineering (WMCC001-05)	5	No	dr. F. Cnossen, dr. C.L. Sibert	AST, P

Cognitive Modelling: Complex Behaviour (WMCC008-05)	5	Yes	prof. dr. N.A. Taatgen, dr. J.P. Borst	AST, PR, P, R
Computational Cognitive Neuroscience (WMCC010-05)	5	Yes	dr. M.K. van Vugt, prof. dr. N.A. Taatgen	AST, P, R
Computational Simulations of Language (WMCC009-05)	5	Yes	dr. J.K. Spenader, <i>vacancy</i>	AST
Language Modeling (WMCC003-05)	5	Yes	dr. J.K. Spenader, dr. S.D. Tokaç	AST, P, R
Models of Human Syntax Processing (WMCC014-05)	5	Yes	dr. S.M. Jones, <i>vacancy</i>	AST, PR
Neuro-ergonomics (WMCC011-05)	5	No	dr. E.G. Akyurek, <i>vacancy</i>	AST, P
Non-Invasive Brain-Computer Interfaces (WMCC016-05)	5	Yes	dr. A.I. Sburlea, <i>vacancy</i>	AST, P, WE
User Models (WMCC004-05)	5	Yes	dr. C.L. Sibert, dr. J.P. Borst	PR, P, R
Course Units in the Specialization(s) Organized by Other Degree Programmes *				
Language Technology Project (LIX025M05) *	5	Yes	dr. K.I.J. Al Khatib	AST, P

* The degree programme that formally owns the course provides the examiners for the course units that are organized by other degree programmes.

** For this course, the examiner depends on the topic of the paper.

*** Students will either take a 45 ECTS credit Master's Project, or a 30 ECTS credit Master's Project and a 15 ECTS credit Internship.

4. Link between Course Units and Learning Outcomes

The tables in this paragraph indicate the relationships between the course units and the learning outcomes of the CCS (MSc.) programme. For the first learning outcome, the letter denotes which specification is covered. For the other learning outcomes, ‘1’ indicates an average contribution, while ‘2’ indicates a strong contribution of a course unit to a specific learning outcome. Section 2 contains a full overview of the learning outcomes.

Learning outcomes	1	2	3	4	5	6
Course Units in the Mandatory Programme						
Advanced Statistical Modelling	b	2	2	1	1	
Cognitive Modeling: Basic Principles and Methods	a, b	2		2	1	1
First-year Research Project	*	*	*	*	2	2
Formal Models of Cognition	a,b,c,d,e,f	1		1	1	
Machine Learning for CCS	g	1	2	1		
Methods in CCS	f	1		1		
Final Research Project	*	*	*	*	2	2
Internship	*	*	*	*	2	2
Course Units in the Specializations						
Applied Cognitive Engineering	a, c, d	2			2	1
Cognitive Engineering	a, c, d	2			2	1
Cognitive Modelling: Complex Behaviour	a, d, f	2		2	2	2
Computational Cognitive Neuroscience	a, f	2		1	2	1
Computational Simulations of Language	e	1			1	
Language Modelling	e	1		1	1	
Language Technology Project	e	1	1		2	1
Models of Human-Syntax Processing	e	1		1	1	
Neuro-ergonomics	c, f	1			2	1
Non-Invasive Brain-Computer Interfaces	g	1	2	1		
User Models	a, c, d	2		2	2	1
Pre-approved Electives from AI / CCS						
Arguing Agents	a		2	2	2	1
Cognitive Robotics			1	2	1	
Computational Social Choice	a		2	2	2	1
Deep Learning	g		2	2	2	1
Deep Reinforcement Learning	g		2	2	2	1
Design of Multi-Agent Systems	a, e		2	2	2	1
Handwriting Recognition	g		2	2	2	1

Logical Aspects of Multi-Agent Systems	a		2	2	2	1
Robotics for AI	g		1	2	1	

** The learning outcomes in projects and internships can differ depending on the type of project/internship.*

The next table indicates the relationships between external (non-AI/CCS) pre-approved elective course units in the CCS (MSc.) programme, and the learning goals. While these courses are not a formal part of the assessment of the individual courses – they are part of the assessment of the full programme, as a significant part of the diploma consists of these pre-approved electives

Learning outcomes	1	2	3	4	5	6
Pre-approved Electives from Other Degree Programmes						
Applied Cognitive Neuroscience						
Auditory and Visual Perception	a, c, d, f	1			2	
Cloud Computing and Cloud-Based Applications						
Computational Semantics	e		1	2	1	
Computer-Mediated Communication	c, d	1			2	
Corpus Linguistics	e		2	1	1	
Introduction Science and Business					2	
Introduction Science and Policy					2	
Introduction to Data Science	a		2	1		
Natural Language Processing (LIX001M05)	e		2	1	1	
Philosophy of Neuroscience	a, f	1			2	
Skills in Science Communication		1			2	
Scientific Visualization		1	2	1		
Semantic Web Technology	a, e		2	1	1	
Trends in Cognitive Neuroscience						
User Interface Evaluation	a, c, d				2	1

5. Course Units offered to Other Degree Programmes

There are no course units offered by Computational Cognitive Science, which are not part of the CCS programme.

6. Full List of Examiners

The full list of examiners consists of two parts: an overview of all the previously listed examiners, i.e. examiners that are entrusted with the responsibility of giving grades to CCS (MSc.) students, and an overview of the examiners that are entrusted with the responsibility of supervising projects for CCS (MSc.) students. These lists are different, since a number of courses are taught/owned by a different degree programme, whose examiners do not supervise projects for the CCS Master's Programme.

The examiners that are involved in the organization of the own course units in the Computational Cognitive Science Master's programme are:

- drs. J.O. van Bijsterveld
- dr. J.P. Borst
- J.D. Cardenas Cartagena, MSc.
- prof. dr. R. Carloni
- dr. Z.L. Christoff
- dr. F. Cnossen
- prof. dr. M. Cook
- R.F. Cunha, MSc.
- M.A. Dhali, MSc.
- 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. J.C. van Rij – Tange
- dr. M. Sabatelli
- dr. A.I. Sburlea
- dr. M.B. Schippers
- dr. C.L. Sibert
- dr. J.K. Spenader
- 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. M. K. van Vugt
- dr. H.A. de Weerd
- dr. B.J. Wolf
- dr. M. Zullich
- dr. E.G. Akyurek
- dr. K.I.J. Al Khatib
- dr. W. Kruijne

The following examiners are allowed to supervise First Year Research Projects and Final Year Research Projects in the Computational Cognitive Science Master's Programme*:

- drs. J.O. van Bijsterveld
- dr. J.P. Borst
- J.D. Cardenas Cartagena, MSc.
- prof. dr. R. Carloni

- dr. Z.L. Christoff
- dr. F. Cnossen
- prof. dr. M. Cook
- R.F. Cunha, MSc.
- M.A. Dhali, MSc.
- 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
- prof. dr. L.R.B. Schomaker
- dr. C.L. Sibert
- dr. J.K. Spenader
- 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. M. K. van Vugt
- dr. H.A. de Weerd
- dr. B.J. Wolf
- dr. M. Zullich

* Other examiners require the approval of the CCS MSc Board of Examiners first.