Assessment plan for the curriculum of the **Master's** degree programme in Computing Science, 2024-2025

Programme director: Alexander Lazovik

Date advice Board of Examiners: 07-06-2024

Date approval Faculty Board:

1. Vision on assessment

1. to enable students to independently show academic skills in a professional context (why), assessment will include activities that require individual and collaborative performance, which each have a substantial contribution to the final grade (what)
2. to install students with the scientific skills essential for contributing to one of the research themes on which the associated research groups are working (why), authentic assessment will be implemented where possible (what)
3. to prepare students for a career in research or design at academia or in an (internationally operating) company (why), assessment is designed to test students independent ability to design and evaluate new computer systems and software in an international and pluricultural context (what)

2. Assessment guidelines

Please explain the general assessment procedures that are used in the programmes. For example, 4-eyes principle in test design, standardised grading forms, rubrics.

1. Every course has a mandatory summative element onsite; overall, assessment can be organized either online or onsite.
2. The formative and summative assessment are designed by the course coordinator in such a way that the assessment covers all the intended learning outcomes of the course.
3. Summative assessments in the form of final exams are designed by the course coordinator and are peer reviewed by the second examiner in order to ensure that the exam assesses the course material representatively and sufficiently.
4. Assessment in the form of an oral exam is carried out by at least 2 examiners (or an examiner and at least one additional expert in the corresponding discipline).
5. All practical work of students should establish a quick (e.g., weekly) feedback loop via formative or graded assessment
6. Automated testing should be used to increase the amount of formative assessment whenever possible

3. Learning outcomes of the degree programme

Learning outcomes for the degree programme, further specified learning outcomes (where relevant) and/or specified for tracks within the degree programme. Please add extra rows if necessary.

	Learning Outcome *At the end of the programme, the graduate …*
G1	Is fully acquainted with the advanced terms and techniques used in Computing Science, and is familiar with a number of classical problems and their solutions;
G2	Is experienced in the effective use of the tools available in solving Computing Science problems, such as compilers, theorem proofs, visualisation software, case-tools and domain specific software and hardware;
G3	Is familiar with Computing Science applications in several other scientific fields of study;
G4	Is capable of clear communication (both oral and in writing) on the subject of Computing Science and its applications;
G5	Is capable of working in a team and in various projects;
G6	Is sensitive to the social aspects of Computing Science applications and his/her own responsibilities therein;
G7	Has specialized knowledge of theories, methods and techniques in one of the following subfields of Computing Science: - Intelligent Systems and Visual Computing - Software Engineering and Distributed Systems - Data Science and Systems Complexity - Science, Business & Policy
G8	Is able, by using scientific data and assessments, to analyse problems in Computing Science or a related scientific field of study, to provide specified solutions to the problem, and – if possible – to materialise these solutions (in the shape of an algorithm or program or an implementation in software or hardware);
G9	Is able to critically read professional literature and to assess its correctness, usability and relevance;
G10	Is able to contribute to the enhancement of scientific understanding in a subfield of Computing Science;
G11	Has a proper understanding of the scientific relevance of problem definitions and results, and of the validity of the scientific method used.

Some subfields in the Computing Science master degree have the following additional learning outcomes:

The Master in Computing Science graduated in the subfield of Software Engineering and Distributed Systems:

	Learning Outcome *At the end of the programme, the graduate …*
P1	Is capable of systematically designing and implementing software systems in cooperation with interested parties;
P2	Is capable of integrating existing and new software components into a system that meets the

	quality criteria that were agreed upon.

The Master in Computing Science graduated in the subfield of Science, Business & Policy (SBP):

	Learning Outcome *At the end of the programme, the graduate …*
M1	Has a full understanding of the way in which businesses and policy organisations are functioning (governments and nongovernmental organisations, NGO's);
M2	Understands the connections between natural science research, trade and industry and governmental policies;
M3	Is able to integrate aspects of natural science, business and management;
M4	Is able to translate a concrete problem definition in business or management into a natural science problem definition;
M5	Is able to connect problem aspects of natural sciences to other relevant subject fields;
M6	Is able to put research data and conclusions into a business or policy context;
M7	Has developed his/her social and communicative skills;
M8	Is able to write texts that are effective and to the point;
M9	Is able to draw up an innovation plan or management plan for either a business or a government organisation;
M10	Is able to give convincing oral presentation;
M11	Is able to deliver an active contribution to plenary discussions;
M12	Familiar with techniques used in business meetings and is capable of chairing a meeting;
M13	Is able to work on a project as part of a team;
M14	Is able to give and receive feedback concerning his/her way of functioning in a team;
M15	Can work in a project;
M16	Is able to fully consider the interests or objectives of the ordering customer;
M17	Is able to plan a project independently;
M18	Is able to cooperate with the relevant parties involved in the project;
M19	Is able to adequately deal with limitations in time, information and means;
M20	Is able to prepare the implementation of a project result;
M21	Is capable of taking professional responsibility;
M22	Is able to take responsibility on behalf of the organisation;

M23	Is able to recognize the strategic aspects of his/her own project;
M24	Is able to provide practical solutions in matters concerning the ethical and professional codes of his/her own field of expertise and of the professional organisation.

4. Overview of assessment methods and examiners

This table shows all the course units for each year of the programme and assessment methods. Please add extra rows if necessary.

Year	Period	Course	Code	EC	Assessment methods	Does (part of the) assessment have a formative function?	First examiner	Second examiner
	1A	Models and Semantics of Computation	WMCS026-05	5	R, P, AST	Yes	J.A. Perez	D. Frumin
	1A	Cloud Computing and Cloud-based Applications	WMCS032-05	5	WE, PR	No	V. Andrikopoulos	A. Lazovik
	1A	Software Architecture	WMCS004-05	5	P, PR	No	P. Avgeriou	D. Feitosa
	1A	Advanced Topics in Security and Privacy	WMCS001-05	5	WE, R, AST	Yes	F. Turkmen	F.F.M. Mohsen
	1A	Network Security Analytics	WMCS036-05	5	R, P, PR	Yes	F.F.M. Mohsen	F. Turkmen
	1A	Introduction to Data Science	WMCS002-05	5	WE, AST	No	K. Bunte	J. Guo
	1A	Social Network Analysis	WMCS028-05	5	R, P, PR	Yes	M. Riveni	G. Azzopardi

Year	Period	Course	Code	EC	Assessment methods	Does (part of the) assessment have a formative function?	First examiner	Second examiner
	1A	Modelling and Simulation	WMCS003-05	5	WE, R	No	M.H.F. Wilkinson	M. Biehl
	1A	Scientific Visualization	WMCS018-05	5	WE, PR	No	S. Frey	J. Kosinka
	1A	Robotic State Estimation	WMCS040-05	5	WE, AST	No	K. Li	J. Guo
	1A	Perception for Visual Computing	WMCS029-05	5	R, P, AST	Yes	C. Tursun	J. Kosinka
	TBD	Innovation to Impact: Turning Science into Startups	TBD	5	R, P	No	R. Rushby	A.Lazovik
	1B	Modal Logic and Proof Theory	WMCS027-05	5	AST	Yes	H. Hansen	R. Ramanayake
	1B	Software Language Engineering	WMCS037-05	5	WE	No	T. van der Storm	P. Avgeriou
	1B	Software Maintenance and Evolution	WMCS013-05	5	AST	No	A. Capiluppi	A. Rastogi

Year	Period	Course	Code	EC	Assessment methods	Does (part of the) assessment have a formative function?	First examiner	Second examiner
	1B	Evidence-Based Software Engineering	WMCS024-05	5	P, PR	No	P. Avgeriou	A. Rastogi
	1B	Enterprise Application Integration	WMCS007-05	5	P, AST	No	D. Karastoyanova	V. Andrikopoulos
	1B	Information Systems	WMCS009-05	5	WE, PR	No	G. Azzopardi	D. Karastoyanova
	1B	Ethical Hacking	WMCS030-05	5	R, P, PR	Yes	F.F.M. Mohsen	F. Turkmen
	1B	Pattern Recognition for CS	WMCS011-05	5	WE, PR	No	J. Guo	M. Biehl
	1B	Neural Networks and Computational Intelligence	WMCS010-05	5	WE, R	Yes	M. Biehl	J. Guo
	1B	Advanced Computer Graphics	WMCS006-05	5	R, P, PR, AST	Yes	J. Kosinka	S. Frey
	1B	Geo-Visualization	WMCS035-05	5	R, P	No	C. Kehl	J. Kosinka

Year	Period	Course	Code	EC	Assessment methods	Does (part of the) assessment have a formative function?	First examiner	Second examiner
	1B	Machine Learning Systems Deployment and Operations	WMCS039-05	5	R, P, AST	No	D. Feitosa	D. Dustegor
	1B	Intelligent Mobile Perception in Practice	WMCS042-05	5	R, P	No	J. Guo	K. Li
	1B	Hardware Security	WMCS043-05	5	R, P	No	F. Merchant	F. Turkmen
1	2A	Student Colloquium	WMCS019-05	5	R, P, PR	No	TBD	TBD
2	2A-2B	Master Thesis	WMCS901-30	30	R, P, PR	No	[supervising lecturers]	G. Azzopardi
	2A	Software Analytics	WMCS031-05	5	R, P, AST	Yes	A. Rastogi	P. Avgeriou
	2A	Advanced Software Architecture	WMCS025-05	5	R, AST	No	M. Stal	P. Avgeriou
	2A	Programs and Interactive Proofs	WMCS033-05	5	P, PR, AST	No	D. Frumin	J.A. Perez
	2A	Scalable Computing	WMCS017-05	5	WE, PR	No	A. Lazovik	A. Tsyganov

Year	Period	Course	Code	EC	Assessment methods	Does (part of the) assessment have a formative function?	First examiner	Second examiner
	2A	Software and System Security	WMCS034-05	5	WE, R, AST	Yes	F. Turkmen	F.F.M. Mohsen
	2A	Theory of Machine Learning	WMCS038-05	5	WE, AST	No	K. Bunte	G.Azzopardi
	2A	Multimodal Mobile Sensing	WMCS041-05	5	WE, AST	No	K. Li	J. Guo
	2A	Computer Vision	WMCS015-05	5	WE, R, PR	No	M.H.F. Wilkinson	M. Babai
1	2B	Research or In-Company Internship	WMCS021-15	15	AST	No	[supervising lecturers]	M.H.F. Wilkinson
	1B	Advanced Machine Learning	WMAI030-05	5	Course given by AI		H. Jaeger	M. Sabatelli
	1B	Logical Aspects of Multi-agent Systems	WMAI020-05	5	Course given by AI		L.C. Verbrugge	J.D. Top

The abbreviations for the relevant teaching methods are explained in the legend of the table.
Examples of assessment methods include:

- *Written Exam (WE)*
- *Multiple Choice (MC)*
- *Oral Exam (OR)*
- *Report (R)*
- *Presentation (P)*

- *Practical Work (PR)*
- *Assignment (AST)*

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. Please add extra rows if necessary.

An X means that the learning outcome is explicitly assessed (not merely addressed) in the course.

		Learning outcomes of the degree programme																
		G						ISVC	DSSC	SEDS							P	
		1	2	3	4	5	6	7	7	7	8	9	10	11			1	2
Period	**Course**	**Year 1 compulsory courses**																
2A	Student Colloquium				X	X	X	X	X	X	X	X	X	X				
2B	Research or In-company Internship	X	X		X	X	X	X	X	X	X		X	X			X	X
Period	**Course**	**Year 2 compulsory courses**																
2A-2B	Master Thesis	X	X		X			X	X	X	X	X	X	X			X	X
Period	**Course**																	
1A	Models and Semantics of Computation	X	X		X					X	X	X		X			X	
1A	Cloud Computing and Cloud-based Applications	X	X			X		X	X	X	X			X			X	X
1A	Software Architecture	X	X		X	X			X	X	X	X	X	X			X	X

		Learning outcomes of the degree programme																
		G						ISVC	DSSC	SEDS							P	
		1	2	3	4	5	6	7	7	7	8	9	10	11			1	2
1A	Advanced Topics in Security and Privacy	X				X			X		X			X				
1A	Network Security Analytics	X	X			X			X		X			X				
1A	Introduction to Data Science	X		X	X	X	X		X		X			X				
1A	Social Network Analysis	X				X	X	X	X	X		X		X				
1A	Modelling and Simulation			X	X	X	X		X		X	X	X	X				
1A	Scientific Visualization	X	X	X		X		X	X		X	X		X			X	X
1A	Robotic State Estimation	X		X	X			X			X	X	X	X				
1A	Perception for Visual Computing									X	X	X	X	X				
	Innovation to Impact: Turning Science into Startups		X		X	X		x	x	x	X							
1B	Modal Logic and Proof Theory	X						X	X				X					

		Learning outcomes of the degree programme																
		G						ISVC	DSSC	SEDS							P	
		1	2	3	4	5	6	7	7	7	8	9	10	11			1	2
1B	Software Language Engineering	X	X			X				X	X			X			X	
1B	Software Maintenance and Evolution	X	X			X	X			X	X			X				X
1B	Evidence-Based Software Engineering				X	X				X	X	X	X	X				
1B	Enterprise Application Integration	X	X			X		X	X	X	X			X			X	X
1B	Information Systems	X			X	X			X		X	X	X	X				
1B	Ethical Hacking	X	X	X	X	X	X		X	X	X	X	X	X				
1B	Pattern Recognition for CS	X	X	X		X	X	X	X	X	X	X	X	X			X	
1B	Neural Networks and Computational Intelligence	X	X	X	X	X	X	X	X		X			X				
1B	Advanced Computer Graphics	X	X	X	X	X		X			X	X		X				

		Learning outcomes of the degree programme																
		G						ISVC	DSSC	SEDS							P	
		1	2	3	4	5	6	7	7	7	8	9	10	11			1	2
1B	Intelligent Mobile Perception in Practice	X	X	X	X	X	X	X			X	X	X	X				
1B	Geo-Visualization		X	X	X	X	X	X			X	X		X			X	
1B	Machine Learning Systems Deployment and Operations	X	X			X			X		X							
	Hardware Security		X		X					X	X	X						
1B	Advanced Machine Learning (*)	X	X		X	X		X			X			X				
1B	Logical Aspects of Multi-agent Systems (*)	X	X		X	X		X		X	X		X	X			X	X
2A	Software Analytics	X			X	X	X		X	X	X	X					X	
2A	Advanced Software Architecture				X	X	X		X	X	X	X	X	X			X	X
2A	Programs and Interactive Proofs		X		X	X				X	X	X						

		Learning outcomes of the degree programme																
		G						ISVC	DSSC	SEDS							P	
		1	2	3	4	5	6	7	7	7	8	9	10	11			1	2
2A	Scalable Computing	X	X			X		X	X	X	X			X			X	X
2A	Software and System Security	X	X		X	X				X	X							X
2A	Theory of Machine Learning	X	X		X	X	X	X			X			X				
2A	Multimodal Mobile Sensing	X	X	X	X	X		X			X	X	X	X				
2A	Computer Vision	X	X	X		X		X			X			X				

** Course offered by the AI department*

The relation between study components and the learning outcomes in the subfield of Science, Business & Policy (learning outcomes M1-M24) can be found in the assessment plan of the SBP track

6. Examiners for Master Thesis Computing Science

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For thesis projects and internships, PhD students and Postdocs can serve as second examiner.