Assessment plan for the curriculum of the **Master's** degree programme in Applied Mathematics, 2025-2026

Programme director: prof. dr. S. (Stephan) Trenn

Date advice Board of Examiners: May 10, 2025

Submission date Faculty Board:

1. Vision on assessment

1. Assessment evaluates the student's skills to formulate and justify mathematical statements.
2. Assessment stimulates the student's ability to recognize which real-world problems are amenable to mathematical analysis and to adjust existing mathematical concepts and methods to study these problems.
3. Assessment stimulates the development of both research and presentation skills in academic and professional contexts.

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. All summative assessment is organized onsite; formative 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. Summative assessments in the form of homework assignments are verified by additional in-person discussions.
5. When making use of software tools when writing assignments, the student must explain how these tools were used.

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 …*
A1	has an understanding of the most important concepts of the field, [knowledge and understanding]
A2	is able to contribute to the scientific advancement of a subfield of applied mathematics,

	[applying knowledge and understanding]
A3	is able to use abstract thinking and mathematical modelling to get to the root of a problem and thus recognize whether existing methods are applicable, or to ascertain that new methods must be developed, [applying knowledge and understanding]
A4	is able to function in multidisciplinary teams, [applying knowledge and understanding]
A5	is familiar with the social and ethical aspects of applying mathematics in practice, [judgement]
A6	understands the scientific relevance of problem definitions and results, and the validity of the scientific method, [judgement]
A7	is able to communicate effectively ideas, problems and solutions with the mathematical, science and engineering communities. [communication]
A8	is able to express him- or herself well both orally and in writing, [communication]
A9	is able to evaluate the scientific literature so as to keep their knowledge up to date. [learning]
T1	has general knowledge of the theories, methods and techniques in the field of applied mathematics, [knowledge and understanding]
T2	has specialized knowledge in at least one of the following subfields of applied mathematics: [knowledge and understanding] a. Computational Mathematics b. Systems, Control and Optimization c. Statistics
T3	has wide experience with the mathematical modelling of problems from actual practice, [applying knowledge and understanding]
T4	has extensive experience with using the relevant mathematical tools. [applying knowledge and understanding]

4. Overview of assessment methods, test moments for course units, 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	EC	Assessment methods	Does (part of the) assessment have a formative function?	Test moment(s) (e.g. mid-term, continuous assessment, exam week, etc)	First examiner	Second examiner
All Specializations								
1	2A	Mathematics and its Environment (WMMA013-05)	5	R, P, AST	No	Exam week	dr. R. Szabó	prof. dr. J. Top
1	2B	Student Colloquium (WMMA029-05)	5	R, P	No	Last lecture week	prof. dr. J.P. Trapman	prof. dr. J.S. Müller, prof. dr. J.G. Peypouquet, prof. dr. O. Lorscheid, dr. M. Meier
2	Whole Year	Research Seminar in Applied Mathematics (WMMA050-05)	5	P	No	Exam week, Continuous	prof. dr. M.K. Camlibel	prof. dr. R.W.C.P Verstappen
2	Whole year	Master Research Project in Applied Mathematics (WMMA901-35)	35	R, P	No	End of project, Continuous	See list below (section 6)	
2	Whole year	Internship Applied Mathematics (WMMA001-15)	15	R, P	No	End of project, Continuous	See list below (section 6)	
1	1A-2B	Guided choice from Mastermath	See Mastermath regulations					
1	2A-2B	Neem Regie (TEM0110-24)	10	See MSc Lerarenopleiding				
Specialization: Systems and Optimization								

Year	Period	Course	EC	Assessment methods	Does (part of the) assessment have a formative function?	Test moment(s) (e.g. mid-term, continuous assessment, exam week, etc)	First examiner	Second examiner
1	1A	Robust Control (WMMA021-05)	5	WE, AST	Yes	Exam week, continuous (homework)	dr. ir. H.J. van Waarde	prof. dr. ir. B. Besselink
1	1A-1B	System and Control (Mastermath) (WMMA003-06)	6	See mastermath regulations				
1	1B	Calculus of Variations and Optimal Control (25/26) (WMMA056-05)	5	WE, AST	Yes	Exam week, continuous (homework)	prof.dr.ir. Besselink	prof. dr. M.K. Camlibel
1	1B	Data-Based Analysis and Control (25/26) (WMMA058-05)	5	AST	Yes	Exam week, continuous (homework)	dr. ir. H.J. van Waarde	prof. dr. M.K. Camlibel
1	1B	Iterative Algorithms (WMMA057-05)	5	R, P, AST	No	Exam week, continuous	prof. dr. J.G. Peypouquet	dr. C.A. Bertoglio
1	1B	Model Reduction for Control (24/25) (WMMA062-05)	5	WE, AST	Yes	Exam week, Continuous (homework)	prof.dr.ir. B. Besselink	dr. ir. H.J. van Waarde
1	2A	Convex Analysis (24/25) (WMMA060-05)	5	WE, AST	No	Exam week, Continuous (homework)	prof. dr. M. K. Camlibel	prof. dr. J.G. Peypouquet
1	2A	Evolution Equations (25/26) (WMMA059-05)	5	WE, AST	Yes	Exam week, Continuous (homework)	prof. dr. J.G. Peypouquet	prof. dr. M. K. Camlibel
1	2A	Nonlinear Control Systems (WMSC003-05)	5	see MSc SC				

Year	Period	Course	EC	Assessment methods	Does (part of the) assessment have a formative function?	Test moment(s) (e.g. mid-term, continuous assessment, exam week, etc)	First examiner	Second examiner
1	*1A-2B*	*Guided choice courses from other specializations*	*see other specializations*					
1	*1A*	*Introduction to Data Science (WMCS002-05)*	*5*	*See MSc CS*				
1	*1A*	*Robotics for IEM (WMIE005-05)*	*5*	*See MSc IE*				
1	*1B*	*Fitting Dynamical Models to Data (WMIE007-05)*	*5*	*See MSc IE*				
1	*2A*	*Analysis and Control of Smart Systems (WMIE015-05)*	*5*	*See MSc IE*				
1	*2B*	*Data-driven Optimization (WMME011-05)*	*5*	*See MSc ME*				

Specialization: Statistics and Data Science								
1	1A	Contemporary Statistics with Applications (24/25) (WMMA015-05)	5	R, AST	No	Exam week, Continuous (homework)	prof. dr. M.A. Grzegorczyk	dr. W.P. Krijnen
1	1A	Introduction to Data Science (WMCS002-05)	5	See MSc CS				
1	1A	Statistical Genomics (25/26) (WMMA008-05)	5	AST, R	No	Exam week, Continuous (homework)	prof. dr. M.A. Grzegorczyk	prof. dr. J.P. Trapman
1	1B	Mathematical Modelling and Statistical Analysis of the Spread of Infectious Diseases (25/26) (WMMA061-05)	5	WE, P	No	Exam week, Continuous (homework)	prof. dr. J.P. Trapman	dr. R. Szabó
1	1B	Topics in Probability and Statistics (WMMA039-05)	5	AST, R, P	Yes	Exam week, Continuous (homework)	prof. dr. T. Müller	dr. S.A. Donderwinkel
1	1B	Fitting Dynamical Models to Data (WMIE007-05)	5	See MSC IE				
1	1B	Statistical Signal Processing (WMAS011-05)	5	See MSc AS				
1	2A	Statistical Consulting (WMMA024-05)	5	R, P	No	Exam week	prof. dr. J.P. Trapman	dr. W.P. Krijnen
1	*1A-2B*	*Guided choice courses from other specializations*	*see other specializations*					
1	*1A.2*	*Data Science in Biomedicine (WMBM023-05)*	*5*	*See MSc BM*				

1	*1B*	*Advanced Machine Learning (WMAI030-05)*	*5*	*See MSc AI*				
1	*1B*	*Neural Networks and Computational Intelligence (WMCS010-05)*	*5*	*See MSc CS*				
1	*1B*	*Pattern Recognition (for CS) (WMCS011-05)*	*5*	*See MSc CS*				
1	*1B.3*	*Big Data & Applications in Biomedicine (WMBM025-05)*	*5*	*See MSc BM*				
1	*2A*	*Nonlinear Control Systems (WMSC003-05)*	*5*	*See MSc SC*				
1	*2B*	*Astronomical Data Science (WMAS007-05)*	*5*	*See MSc AS*				
1	*2B*	*Data-driven Optimization (WMME011-05)*	*5*	*See MSc ME*				
Specialization: Computational Mathematics								
1	1A	Computational fluid dynamics (WMMA012-05)	5	WE, PR	No	Exam week, Continuous (homework)	dr. ir. R. Luppes	prof. dr. ir. R.W.C.P. Verstappen
1	1A	Model Reduction for PDE (24/25) (WMMA053-05)	5	R, P, AST	No	Exam week, Continuous	dr. J. Koellermeier	prof. dr. ir. R.W.C.P. Verstappen
1	1B	Numerical Simulation of Turbulence (25/26) (WMMA063-05)	5	WE, R, P	No	Exam week, halfway	prof. dr. ir. R.W.C.P. Verstappen	dr. ir. R. Luppes
1	1B	Finite Element Methods and Applications (WMMA051-05)	5	WE, AST	Yes	Exam week, Continuous	dr. C.A. Bertoglio	prof. dr. ir. R.W.C.P. Verstappen

1	1B	Iterative Algorithms (WMMA057-05)	5	R, P, AST	Yes	Exam week, continuous	prof. dr. J.G. Peypouquet	dr. C.A. Bertoglio
1	2A	Topics in Numerical Mathematics A (25/26) (WMMA064-05)	5	AST, R, P	Yes	Exam week, continuous	dr. M. Meier	dr. C.A. Bertoglio
1	2A	Topics in Numerical Mathematics B (26/27) (WMMA065-05)	5	TBA	TBA	TBA	TBA	TBA
1	2B	Coupled Problems (24/25) (WMMA052-05)	5	WE, AST	Yes	Exam week, continuous	dr. C.A. Bertoglio	dr. J. Koellermeier
1	*1A-2B*	*Guided choice courses from other specializations*	*see other specialization*					
1	*1A*	*Introduction to Data Science (WMCS002-05)*	*5*	*See MSc CS*				
1	*1B*	*Advanced Machine Learning (WMAI030-05)*	*5*	*See MSc AI*				
1	*1B*	*Computational Solid Mechanics (WMME028-05)*	*5*	*See MSc ME*				
1	*1B*	*Fitting Dynamical Models to Data (WMIE007-05)*	*5*	*See MSc IE*				
1	*1B*	*Neural Networks and Computational Intelligence (WMCS010-05)*	*5*	*See MSc CS*				
1	*2A*	*Nonlinear Control Systems (WMSC003-05)*	*5*	*See Msc SC*				

1	*2B*	*Data-driven Optimization (WMME011-05)*	*5*	*See MSc ME*

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)*

The abbreviations for other master programmes are as follows:
- MSc AI: Artificial Intelligence
- MSc AS: Astronomy
- MSc BM: Biomedical Sciences
- MSc CS: Computer Science
- MSc IEM: Industrial Engineering and Management
- MSc ME: Mechanical Engineering
- MSc SC: Systems and Control

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																		
		A 1	A 2	A 3	A 4	A 5	A 6	A 7	A 8	A 9	T 1	T 2	T 3	T 4						
Period	**Course**	**Year 1 –compulsory courses**																		
2A	Mathematics and its Environment (WMMA013-05)					X	X		X		X									
2B	Student Colloquium (WMMA029-05)			X			X	X	X	X	X	X	X	X						
Specialization: Systems and Optimization																				
1A	Robust Control (WMMA021-05)	X		X	X		X	X	X		X	X								
1B	Calculus of Variations and Optimal Control (25/26) (WMMA056-05)	X		X			X				X	X		X						
1B	Data-Based Analysis and Control (25/26) (WMMA058-05)	X	X	X			X	X		X		X	X	X						
1B	Iterative Algorithms (WMMA057-05)	X					X	X	X		X	X	X	X						
1B	Model Reduction for Control (WMMA062-05)	X	X	X			X	X			X	X	X	X						

		Learning outcomes of the degree programme																		
		A 1	A 2	A 3	A 4	A 5	A 6	A 7	A 8	A 9	T 1	T 2	T 3	T 4						
2A	Convex Analysis (24/25) (WMMA060-05)	X	X	X			X	X		X	X	X	X	X						
2A	Evolution Equations (25/26 (WMMA059-05)	X	X	X			X	X		X	X	X	X	X						
2A	Nonlinear Control Systems (WMSC003-05)	X	X	X	X			X			X	X	X	X						
Specialization: Statistics and Data Science																				
1A	Contemporary Statistics with Applications (WMMA015-05)	X	X				X	X		X	X									
1A	Introduction to Data Science (WMCS002-05)	X	X	X			X	X	X		X	X	X							
1A	Statistical Genomics (25/26) (WMMA008-05)	X	X		X		X	X			X									
1B	Mathematical Modelling and Statistical Analysis of the Spread of Infectious Diseases (25/26) (WMMA061-05)	X	X	X			X	X	X	X	X	X	X	X						
1B	Topics in Probability and Statistics (WMMA039-05)	X	X	X			X	X	X		X	X	X	X						

		Learning outcomes of the degree programme																		
		A 1	A 2	A 3	A 4	A 5	A 6	A 7	A 8	A 9	T 1	T 2	T 3	T 4						
1B	Fitting Dynamical Models to Data (WMIE007-05)	X			X		X	X			X	X	X	X						
1B	Statistical Signal Processing (WMAS011-05)	X			X		X	X			X	X	X	X						
2A	Statistical Consulting (24/25) (WMMA024-05)	X		X	X	X	X	X	X											
Specialization: Computational Mathematics																				
1A	Computational fluid dynamics (WMMA012-05)	X			X		X	X	X		X	X	X	X						
1A	Model Reduction for PDE (24/25) (WMMA053-05)	X	X	X			X	X	X		X	X	X	X						
1B	Numerical Simulation of Turbulence (25/26) (WMMA063-05)	X	X	X			X				X	X	X	X						
1B	Finite Element Methods and Applications (WMMA051-05)	X			X		X	X	X		X	X	X	X						
1B	Iterative Algorithms (WMMA057-05)	X					X	X	X		X	X	X	X						
2A	Topics in Numerical Mathematics A	X	X	X			X				X	X	X	X						

		Learning outcomes of the degree programme																		
		A 1	A 2	A 3	A 4	A 5	A 6	A 7	A 8	A 9	T 1	T 2	T 3	T 4						
	(25/26) (WMMA064-05)																			
2A	Topics in Numerical Mathematics B (26/27) (WMMA065-05)	X	X	X			X				X	X	X	X						
2B	Coupled Problems (24/25) (WMMA052-05))	X	X	X			X	X	X		X	X	X	X						
Period	**Course**	**Year 1 Electives (if applicable)**																		
All Specializations																				
2A+2B	Neem Regie (Dutch) (TEM0110-24)					X			X	X										
Specialization: Systems and Optimization																				
1A	Computational Fluid Dynamics (WMMA012-05)	X			X		X	X	X		X	X	X	X						
1A	Contemporary Statistics with Applications (WMMA015-05)	X	X				X	X		X	X									
1A	Introduction to Data Science (WMCS002-05)	X	X	X			X	X	X		X	X	X							
1A	Robotics for IEM (WMIE005-05)				X			X					X	X						
1B	Finite Element Methods and	X			X		X	X	X		X	X	X	X						

		Learning outcomes of the degree programme																		
		A 1	A 2	A 3	A 4	A 5	A 6	A 7	A 8	A 9	T 1	T 2	T 3	T 4						
	Applications (WMMA051-05)																			
1B	Fitting Dynamical Models to Data (WMIE007-05)	X			X		X	X			X	X	X	X						
2A	Analysis and Control of Smart Systems (WMIE015-05)				X			X					X	X						
2A	Statistical Consulting (WMMA024-05)	X		X	X	X	X	X	X											
2B	Data-driven Optimization (WMME011-05)		X					X				X								
Specialization: Statistics and Data Science																				
1A	Cloud Computing and Cloud-based Applications (WMCS032-05)										X		X							
1A	Computational fluid dynamics (WMMA012-05)	X			X		X	X	X		X	X	X	X						
1A	Robust Control (WMMA021-05)	X		X	X		X	X	X		X	X								
1A.2	Data Science in Biomedicine (WMBM023-05)										X	X	X	X						

		Learning outcomes of the degree programme																		
		A 1	A 2	A 3	A 4	A 5	A 6	A 7	A 8	A 9	T 1	T 2	T 3	T 4						
1B	Advanced Machine Learning (WMAI030-05)		X								X			X						
1B	Data-based Analysis and Control (25/26) (WMMA058-05)	X	X	X			X	X		X		X	X	X						
1B	Finite Element Methods and Applications (WMMA051-05)	X			X		X	X	X		X	X	X	X						
1B	Neural Networks and Computational Intelligence (WMCS010-05)		X								X			X						
1B	Pattern Recognition (for CS) (WMCS011-05)											X		X						
1B.3	Big Data & Applications in Biomedicine (WMBM025-05)											X	X	X						
2A	Nonlinear Control Systems (WMSC003-05)	X	X	X			X				X	X		X						
2B	Astronomical Data Science (WMAS007-05)											X	X							
2B	Data-driven Optimization (WMME011-05)		X					X				X								

		Learning outcomes of the degree programme																		
		A 1	A 2	A 3	A 4	A 5	A 6	A 7	A 8	A 9	T 1	T 2	T 3	T 4						
Specialization: Computational Mathematics																				
1A + 1B	Numerical Linear Algebra (MasterMath) (WMMA002-08)	X	X	X				X			X	X		X						
1A	Contemporary Statistics with Applications (WMMA015-05)	X	X				X	X		X	X									
1A	Introduction to Data Science (WMCS002-05)	X	X	X			X	X	X		X	X	X							
1A	Robust Control (WMMA021-05)	X		X	X		X	X	X		X	X								
1B	Advanced Machine Learning (WMAI030-05)		X								X			X						
1B	Computational Solid Mechanics (WMME028-05)		X									X	X							
1B	Data-based Analysis and Control (25/26) (WMMA058-05)	X	X	X			X	X		X		X	X	X						
1B	Fitting Dynamical Models to Data (WMIE007-05)	X			X		X	X			X	X	X	X						
1B	Model Reduction for Control (WMMA062-05)	X	X	X			X	X			X	X	X	X						

		Learning outcomes of the degree programme																		
		A 1	A 2	A 3	A 4	A 5	A 6	A 7	A 8	A 9	T 1	T 2	T 3	T 4						
1B	Neural Networks and Computational Intelligence (WMCS010-05)		X								X			X						
2A	Nonlinear Control Systems (WMSC003-05)	X	X	X	X			X			X	X	X	X						
2A	Statistical Consulting (WMMA024-05)	X		X	X	X	X	X	X											
2B	Data-driven Optimization (WMME011-05)		X					X				X								
Period	**Course**	**Year 2 compulsory courses**																		
Whole year	Research Seminar in Applied Mathematics (WMMA050-05)		X	X			X	X	X	X	X	X	X	X						
Whole year	Master Research Project in Applied Mathematics (WMMA901-35)	X	X	X		X	X	X	X	X	X	X	X	X						
Whole Year	Internship Applied Mathematics (WMMA001-15)	X	X	X	X	X	X	X	X	X	X	X	X	X						

6. Examiners for Research Project and Internship

Specialization Computational Mathematics
dr. C.A. Bertoglio
dr. J. Koellermeier
dr. ir. R. Luppes
prof. dr. ir. R.W.C.P. Verstappen
dr. M. Meier

Specialization Systems and Optimization
prof. dr. ir. B. Besselink
prof. dr. M.K. Camlibel
prof. dr. J.G. Peypouquet
prof. dr. S. Trenn
dr. ir. H.J. van Waarde

Specialization Statistics and Data Science
dr. G.F.Y. Bonnet
dr. S.A. Donderwinkel
prof. dr. M.A. Grzegorczyk
dr. W.P. Krijnen
prof. dr. T. Müller
dr. R. Szabó
prof. dr. J.P. Trapman

The first examiner of a research project for a certain specialization must stem from the above list of examiners for that specific specialization. The second examiner of the research project can be any person from the above list (regardless of the specialization) or any examiners of the research project of the master's degree programme in mathematics.

On an individual basis the Board of Examiners can allow examiners of other degree progammes to act as examiner for the research project of the master's degree programme in applied mathematics as well.