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

Programme director: dr. A.E. (Alef) Sterk

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 precise mathematical arguments.
2. Assessment stimulates the student's ability to recognize which real-world problems are amenable to mathematical analysis and to use mathematical concepts and methods to study these problems.
3. Assessment stimulates the development of both written and oral communication 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. 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 *Bachelor's graduates in Applied Mathematics …*
	A. Generic learning outcomes – Knowledge
A1	have general knowledge of the foundations and principal branches of (applied) mathematics.
A2	have mastered the basic concepts of applied mathematics (see Appendix I for further specification) to a certain extent and are familiar with the interrelationships of these concepts within mathematics and applied mathematics as well as with other disciplines (e.g. in science and engineering).

A3	have in-depth knowledge of several current topics within applied mathematics.
A4	are familiar with the quantitative character of applied mathematics and have an understanding of the mathematical methods used in various areas of application, particularly including computer-aided methods.
A5	have sufficient knowledge and understanding of applied mathematics to successfully complete a follow-up Master's degree programme in Applied Mathematics.
A6	are aware of the societal, ethical and social aspects involved in the field of applied mathematics.
	B. Generic learning outcomes – Skills
B1	(Research) are able to draw up a research question, design, plan and conduct research and report on it independently with a certain degree of supervision and to evaluate the value and limitations of their research and assess its applicability outside their own field. See Appendix II for further specification.
B2	(Designing and Modelling) are able to translate a problem, in particular a design problem, into a plan of approach and – taking into account requirements and/or technical preconditions – find a solution.
B3	(Gathering information) are able to gather relevant information using modern means of communication and to critically interpret this information.
B4	(Collaborating) are able to collaborate in teams on technical-scientific problems, are able to work on (interdisciplinary) projects, taking responsibility for their (mathematical) contributions.
B5	(Communicating) are able to communicate orally and in writing in academic and professional contexts, in English, and are able to interact with mathematicians as well as scientists and engineers. They are familiar with the relevant means of communication.
B6	(Reflecting) are able to assess their own actions and those of others in a natural sciences and engineering context, bearing in mind the social/societal and ethical aspects.
B7	(Learning skills) are able to apply learning skills that enable them to pursue a follow-up degree and acquire knowledge in new fields with a high level of autonomy.
	Specified basic knowledge related learning outcomes
1.1	have mastered the basic concepts and techniques of mathematics, in particular single and multivariable calculus, linear algebra, analysis, ordinary differential equations, probability theory, statistics and algebra.
1.2	have knowledge of more advanced subjects within the fields of applied analysis, numerical mathematics, dynamical systems and systems theory.
1.3	have knowledge of more advanced topics in the fields of Computational Mathematics, and Systems and Control.
1.4	have gained knowledge of and experience in the 'heart' of mathematics, i.e., the truth and value of exact mathematical proof.
1.5	have knowledge of basic sciences at a level necessary to apply mathematical methods, and are aware of the wider multidisciplinary context of science and engineering

1.6	are able to use mathematical software packages in an effective way or, if necessary, modify programs themselves.
	Specified skills related learning outcomes - Research
2.1	have an academic attitude, which means they are curious, critical, creative and dare to show initiative.
2.2	are able to formulate (relatively simple) problems in the mathematical language, pose relevant mathematical questions and address them in an exact way, and if necessary, adapt the problem to make it mathematically tractable.
2.3	are able to articulate assumptions, understand the importance of detailed definitions, and are able to think in an organized way, to apply exact logical arguments when solving problems, and to generalize and abstract.
2.4	are able to model, analyse and abstract simple problems that are outside the scope of their own study programme and to independently acquire new knowledge to this end.
	Specified skills related learning outcomes - Designing and modelling
2.5	are able, under supervision and from the perspective of their field of interest, to translate a problem into a relevant mathematical problem definition and to this end formulate and evaluate a solution based on source research.
2.6	are able to formulate concrete problems from application areas as mathematical problems, and are able to discuss the assumptions underlying their mathematical model.
2.7	are able to approach mathematical problems on the basis of a certain logical system and with determination to find the right method of approach and are aware of the limitations of the chosen method.
2.8	are aware of the importance of researching specific cases and examples and have the attitude and skills necessary to critically evaluate the solutions found, test them for correctness and interpret them.
2.9	are able, by abstracting and modelling, to delve into the root of a problem and determine whether existing methods can be applied or new methods must be developed.
2.10	are able to conduct searches of literature, to critically use scientific databases and other sources of information, or to consult specialists to carry out numerical simulations and mathematical analysis in order to study problems in science and engineering.

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**
1	1A	Calculus 1 (WBMA003-05)	5	WE, AST	Yes	Exam week, mid-term, continuous assessment (homework)	dr. T.F. Görbe	dr. H. Jardón Kojakhmetov
1	1A	Linear Algebra 1 (WBMA020-05)	5	WE	Yes	Exam week	prof. dr. M.K. Camlibel	dr. ir. H.J. van Waarde
1	1A	Sets and Numbers (WBMA051-05)	5	WE	No	Mid-term, exam week	prof. dr. R.I. van der Veen	dr. P. Kilicer
1	1B	Analysis (WBMA012-05)	5	WE, AST	Yes	Exam week, mid-term, continuous assessment (homework)	prof. dr. M. Seri	dr. A.E. Sterk
1	1B	Calculus 2 (WBMA029-05)	5	WE, AST	No	Mid-term, exam week, continuous assessment (homework)	prof. dr. H. Waalkens	dr. T.F. Görbe
1	1B	Introduction to Graph Theory (WBMA052-05)	5	WE, AST	Yes	Exam week, continuous assessment (homework)	dr. S.A. Donderwinkel	prof. dr. T. Müller

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	2A	Linear Algebra 2 (WBMA035-05)	5	WE	Yes	Mid-term, Exam week	dr. ir. H.J. van Waarde	prof. dr. J. Top
1	2A	Mechanics and Relativity (WBMA060-05)	5	WE, AST	Yes	Exam week, continuous assessment (homework)	dr. C. Simsek	prof. dr. D. Roest
1	2A	Scientific Programming (WBMA053-05)	5	WE, AST	Yes	Exam week, continuous assessment (homework)	prof. dr. C.A. Bertoglio	dr. ir. R. Luppes
1	2B	Linear Systems (WBMA043-05)	5	WE, AST	Yes	Exam week, continuous assessment (homework)	prof. dr. ir. B. Besselink	dr. A.E. Sterk
1	2B	First-year Project Mathematics (WBMA041-05)	5	R, P	No	Exam week	prof. dr. Oliver Lorscheid	Staff members who supervise a project
1	2B	First-year Project Applied Mathematics (WBMA40-05)	5	R, P	No	Exam week	prof. dr. Oliver Lorscheid	Staff members who supervise a project
1	2B	Probability Theory (WBMA046-05)	5	WE, AST	Yes	Exam week, continuous assessment (homework)	dr. G.F.Y. Bonnet	prof. dr. T. Müller
2	1A	Introduction to Optimization (WBMA054-05)	5	WE, PR, AST	Yes	Exam week, continuous	prof. dr. J.G. Peypouquet	prof. dr. M.K. Camlibel

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
						assessment (homework)		
2	1A	Metric and Topological Spaces (WBMA036-05)	5	WE, AST	No	Exam week, continuous assessment (incl. homework)	dr. A.V. Kiselev	prof. dr. T. Müller
2	1A	Statistics (WBMA009-05)	5	WE, AST	No	Exam week, continuous assessment (homework)	prof. dr. M.A. Grzegorczyk	dr. W.P. Krijnen
2	1B	Complex Analysis (WBMA018-05)	5	WE, AST	No	Exam week, continuous assessment (homework)	dr. C. Karakurt	prof. dr. O. Lorscheid
2	1B	Differential Equations in Science and Engineering (WBMA061-05)	5	WE, AST	No	Exam week, continuous assessment	prof. dr. ir. R.W.C.P. Verstappen	dr. J. Koellermeier
2	1B	Multivariable Analysis (WBMA022-05)	5	WE, AST	Yes	Exam week, continuous assessment (homework)	dr. H. Jardón Kojakhmetov	dr. N. Martynchuk
2	2A	Functional Analysis (WBMA033-05)	5	WE, AST	Yes	Exam week, continuous assessment (homework)	dr. A.E. Sterk	prof. dr. J.G. Peypouquet

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
2	2A	Numerical Analysis (WBMA062-05)	5	WE, AST	Yes	Exam week, continuous assessment	prof. dr. C.A. Bertoglio	dr. ir. R. Luppes
2	2A	Project Mathematical Modelling (24/25) (WBMA055-05)	5	R, P	No	Continuous assessment, end of project	prof. dr. ir. R.W.C.P. Verstappen	dr. ir. R. Luppes
2	2A	Project Statistical Reasoning (25/26) (WBMA038-05)	5	WE, AST	No	Exam week, continuous assessment (homework)	prof. dr. M.A. Grzegorczyk	dr. W.P. Krijnen
2	2A	Project Systems Theory (WBMA027-05)	5	R, P	Yes	Exam week	prof. dr. S. Trenn	dr. ir. H.J. van Waarde
2	2B	Computational Methods of Science (WBMA004-05)	5	WE, AST/P	No	Exam week, continuous assessment (homework)	dr. ir. R. Luppes	prof. dr. ir. R.W.C.P. Verstappen
2	2B	Mathematical Modelling (WBMA007-05)	5	AST	Yes	Continuous assessment (homework)	prof. dr. S. Trenn	Prof. dr. ir. R.W.C.P. Verstappen
2	2B	Partial Differential Equations (WBMA008-05)	5	WE, AST	Yes	Exam week, mid-term, continuous assessment (homework)	dr. A.E. Sterk	prof. dr. M. Seri
3	1B	Advanced Systems Theory (WBMA001-05)	5	WE, AST	No	Exam week, continuous	prof. dr. M.K. Camlibel	prof. dr. ir. B. Besselink

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
						assessment (homework)		
3	1B	Numerical Linear Algebra (WBMA063-05)	5	WE, AST	Yes	Exam week, continuous assessment	dr. M. Meier	prof. dr. ir. R.W.C.P. Verstappen
3	1B	Statistical Modelling (WBMA028-05)	5	WE, AST	No	Exam week, continuous assessment (homework)	dr. W.P. Krijnen	prof. dr. M.A. Grzegorczyk
3	2A	Mathematics & Society: Ethical and Professional Aspects (WBMA049-05)	5	WE, R, P	Yes	Exam week, continuous assessment	drs. G.A.H. Laugs	drs. J. Zevenberg
3	2A	Preparation Bachelor's Project (WBMA056-05)	5	P, R, AST	No	Exam week, continuous assessment	prof. dr. C. Salgado Guimarães da Silva	prof. dr. J. Top
3	2B	Bachelor's Project Applied Mathematics (WBMA901-15)	15	R, P	No	End of project	See list below (section 6)	
		Electives from Mathematics and other programmes (see assessment plan of those programmes)						

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																								
		A1	A2						A3	A4	A5	A6	B1				B2						B3	B4	B5	B6	B7
			1.1	1.2	1.3	1.4	1.5	1.6					2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	2.10					
Period	**Course**	**Year 1 –compulsory courses**																								
1A	Calculus 1 (WBMA003-05)	X	X			X				X																
1A	Linear Algebra 1 (WBMA020-05)	X	X			X				X																
1A	Sets and Numbers (WBMA051-05)	X	X			X																				
1B	Analysis (WBMA012-05)	X	X			X																				
1B	Calculus 2 (WBMA029-05)	X	X			X				X																
1B	Introduction to Graph Theory (WBMA052-05)	X	X			X																				
2A	Linear Algebra 2 (WBMA035-05)	X	X			X																				

		Learning outcomes of the degree programme																											
		A 1	A 2						A 3	A 4	A 5	A 6	B 1				B 2						B 3	B 4	B 5	B 6	B 7
			1.1	1.2	1.3	1.4	1.5	1.6					2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	2.10					
2A	Mechanics and Relativity (WBMA060-05)	X	X				X											X									
2A	Scientific Programming (WBMA053-05)	X	X				X	X		X								X		X				X	X		
2B	Linear Systems (WBMA043-05)	X	X			X	X											X									
2B	Probability Theory (WBMA046-05)	X	X			X																					
Period	**Course**	**Year 1 Electives (if applicable)**																											
2B	First-year Project Mathematics (WBMA041-05)	X	X			X		X					X	X	X	X			X	X			X	X	X	X	X		
2B	First-year Project Applied Mathematics (WBMA40-05)	X	X				X	X		X			X	X	X	X	X	X	X	X		X	X	X	X	X	X		
Period	**Course**	**Year 2 compulsory courses**																											
1A	Introduction to Optimization (WBMA054-05)	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	B 1				B 2						B 3	B 4	B 5	B 6	B 7
			1.1	1.2	1.3	1.4	1.5	1.6					2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	2.10					
1A	Metric and Topological Spaces (WBMA036-05)	X	X			X					X																	
1A	Statistics (WBMA009-05)	X	X			X	X	X		X	X							X	X									
1B	Complex Analysis (WBMA018-05)	X	X			X					X																	
1B	Differential Equations in Science and Engineering (WBMA061-05)	X	X	X	X		X		X	X	X								X									
1B	Multivariable Analysis (WBMA022-05)	X	X			X					X																	
2A	Functional Analysis (WBMA033-05)	X	X			X					X																	
2A	Numerical Analysis (WBMA062-05)	X	X	X	X	X	X	X	X	X	X								X	X				X	X			
2B	Computational Methods of	X	X	X	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	B 1				B 2						B 3	B 4	B 5	B 6	B 7
			1.1	1.2	1.3	1.4	1.5	1.6					2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	2.10					
	Science (WBMA004-05)																												
2B	Mathematical Modelling (WBMA007-05)	X	X	X			X		X	X	X					X		X	X					X	X	X	X		
2B	Partial Differential Equations (WBMA008-05)	X	X	X			X			X	X																		
Period	**Course**	**Year 2 Electives (if applicable)**																											
2A	Project Mathematical Modelling (WBMA055-05)	X	X	X	X		X		X	X	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X		
2A	Project Statistical Reasoning (25/26) (WBMA038-05)	X	X				X	X	X	X	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X		
2A	Project Systems Theory (WBMA027-05)	X	X	X	X		X	X	X	X	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X		
Period	**Course**	**Year 3 compulsory courses**																											

		Learning outcomes of the degree programme																										
		A1	A2						A3	A4	A5	A6	B1				B2						B3	B4	B5	B6	B7
			1.1	1.2	1.3	1.4	1.5	1.6					2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	2.10					
2A	Mathematics & Society: Ethical and Professional Aspects (WBMA049-05)											X	X										X	X	X	X	X
2A	Preparation Bachelor's Project (WBMA056-05)	X	X	X					X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2B	Bachelor's Project Applied Mathematics (WBMA901-15)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Period	**Course**	**Year 3 Electives (if applicable)**																										
1B	Advanced Systems Theory (WBMA001-05)	X	X	X	X	X	X				X																	
1B	Numerical Linear Algebra (WBMA063-05)	X	X	X	X		X	X		X	X									X								
1B	Statistical Modelling (WBMA028-05)	X	X	X			X	X		X	X							X	X	X								

6. List of examiners for the Bachelor Project Applied Mathematics

Examiners for the Bachelor Project Applied Mathematics
prof. dr. C.A. Bertoglio
prof. dr. ir. B. Besselink
dr. G.F.Y. Bonnet
prof. dr. M.K. Camlibel
dr. S.A. Donderwinkel
dr. T.F. Görbe
prof. dr. M.A. Grzegorczyk
dr. H. Jardón Kojakhmetov
dr. C. Karakurt
dr. P. Kilicer
dr. A.V. Kiselev
dr. J. Koellermeier
dr. W.P. Krijnen
prof. dr. O. Lorscheid
dr. ir. R. Luppes
dr. M. Meier
prof. dr. J.S. Müller
prof. dr. T. Müller
dr. N. Martynchuk
dr. E. Özman
prof. dr. J.G. Peypouquet
prof. dr. C. Salgado Guimarães da Silva
prof. dr. M. Seri
dr. A.E. Sterk
dr. R. Szabó
prof. dr. J.P. Trapman
prof. dr. J. Top
prof. dr. S. Trenn
prof. dr. R.I. van der Veen
prof. dr. ir. R.W.C.P. Verstappen
prof. dr. H. Waalkens
dr. ir. H.J. van Waarde

On an individual basis the Board of Examiners can allow examiners of other degree programmes to act as examiner for the Bachelor Project of the Bachelor's degree programme in Applied Mathematics as well.