Applied Mathematics MSc Program
(starting from 2025)

Coordinator: Prof. Tibor Krisztin, krisztin@math.u-szeged.hu

The duration of the program is 4 semesters. Students have to obtain 120 credit points according to the table below. The following specializations are available: Applied Analysis, Mathematical Data Science, Industrial Mathematics, and Financial Mathematics. Students have to choose a specialization at the end of the first semester.

	Applied Analysis	Mathematical Data Science	Industrial Mathematics	Financial Mathematics
Common obligatory courses	33	33	33	33
Obligatory courses of specialization	44	40	44	45
Elective courses	7	7	7	6
Optional courses	6	10	6	6
Master's Thesis	20	20	20	20
Total	**120**	**120**	**120**	**120**

Below one can find the details of the 4 specializations. The courses in boldface are compulsory for all specializations; they can be found in Neptun in the curriculum of the Applied Mathematics Program. The rest of the courses belong to the curriculum of the respective specialization. Elective courses are listed at the end of this guide. An optional course can be any course offered by the university. The semesters for the elective and optional courses are only suggestions; students can take those courses in any semester.

Contact hours are given in the format lecture + practice. In case of a 0, the respective unit does not exist. The last characters of the Neptun codes of lectures are E or EA and of practical courses are G or GA.

Applied Analysis Specialization

Coordinator: Prof. Tibor Krisztin, krisztin@math.u-szeged.hu

Course name	Course code	Number of hours	Credit	Preliminary requirement
Semester 1				
Algorithms and Their Complexity	ME4151	2 + 2	6	
Applied Analysis	ME4131	2 + 2	6	
Differential Equations	ME4121	2 + 2	6	
Discrete Mathematics 2	ME4152	2 + 2	6	
Probability Theory	ME4161	3 + 2	7	
Total in Semester 1			**31**	
Semester 2				
Functional Analysis	ME4132	2 + 2	6	
Numerical Methods for Differential Equations	ME4122	2 + 2	6	Differential Equations
Nonlinear Dynamics *	ME4123	2 + 2	6	Differential Equations
Numerical Mathematics	ME4126	2 + 1	4	
Statistical Analysis of Time Series	ME4162	2 + 2	6	Probability Theory
Total in Semester 2			**28**	
Semester 3				
Dynamic Modelling	ME4128	2 + 2	6	
Topology and Manifolds	ME4141	2 + 2	6	
Elective and optional courses			9	
Diploma Project	ME4191	0 + 2	10	
Total in Semester 3			**31**	
Semester 4				
Optimization Methods	ME4153	2 + 2	6	
Nonlinear programming		2 + 1	3 + 1	
Partial Differential Equations *	ME4124	2 + 2	6	Differential Equations
Elective and optional courses			4	
Degree Thesis	ME4192	0 + 2	10	
Total in Semester 4			**30**	

* The place of the courses Dynamical Systems and Partial Differential Equations is not fixed; sometimes they are offered in the reverse order.

Mathematical Data Science Specialization

Coordinator: Prof. Gergely Röst, rost@math.u-szeged.hu

Course name	Course code	Number of hours	Credit	Preliminary requirement
Semester 1				
Algorithms and Their Complexity	ME4151	2 + 2	6	
Applied Analysis	ME4131	2 + 2	6	
Differential Equations	ME4121	2 + 2	6	
Discrete Mathematics 2	ME4152	2 + 2	6	
Probability Theory	ME4161	3 + 2	7	
Total in Semester 1			**31**	
Semester 2				
Functional Analysis	ME4132	2 + 2	6	
Control Theory *	ME4125	2 + 2	6	Differential Equations
Mathematical Data Science	ME4127	2 + 2	6	
Numerical Mathematics	ME4126	2 + 1	4	
Statistical Analysis of Time Series	ME4162	2 + 2	6	Probability Theory
Total in Semester 2			**28**	
Semester 3				
Data Mining		2 + 2	3 + 2	
Dynamic Modelling	ME4128	2 + 2	6	
Elective and optional courses			10	
Diploma Project	ME4191	0 + 2	10	
Total in Semester 3			**31**	
Semester 4				
Optimization Methods	ME4153	2 + 2	6	
Advanced Algorithms *	ME4112	3 + 0	4	
Artificial Neural Networks and their Applications		2 + 0	3	
Elective and optional courses			7	
Degree Thesis	ME4192	0 + 2	10	
Total in Semester 4			**30**	

* The place of the courses Control Theory and Advanced Algorithms is not fixed; sometimes they are offered in the reverse order.

Industrial Mathematics Specialization

Coordinator: Prof. Gergely Röst, rost@math.u-szeged.hu

Course name	Course code	Number of hours	Credit	Preliminary requirement
Semester 1				
Algorithms and Their Complexity	ME4151	2 + 2	6	
Applied Analysis	ME4131	2 + 2	6	
Differential Equations	ME4121	2 + 2	6	
Discrete Mathematics 2	ME4152	2 + 2	6	
Probability Theory	ME4161	3 + 2	7	
Total in Semester 1			**31**	
Semester 2				
Functional Analysis	ME4132	2 + 2	6	
Numerical Methods for Differential Equations	ME4122	2 + 2	6	Differential Equations
Control Theory *	ME4125	2 + 2	6	Differential Equations
Numerical Mathematics	ME4126	2 + 1	4	
Statistical Analysis of Time Series	ME4162	2 + 2	6	Probability Theory
Total in Semester 2			**28**	
Semester 3				
Electrodynamics	FN2024	2 + 0	3	
Theoretical Mechanics	FN2023	4 + 0	5	
Dynamic Modelling	ME4128	2 + 2	6	
Elective and optional courses			7	
Diploma Project	ME4191	0 + 2	10	
Total in Semester 3			**31**	
Semester 4				
Optimization Methods	ME4153	2 + 2	6	
Advanced Algorithms *	ME4112	3 + 0	4	
Advanced Approximate and Symbolic Computations		2 + 1	3 + 1	
Elective and optional courses			6	
Degree Thesis	ME4192	0 + 2	10	
Total in Semester 4			**30**	

* The place of the courses Control Theory and Advanced Algorithms is not fixed; sometimes they are offered in the reverse order.

Financial Mathematics Specialization

Coordinator: Prof. Péter Kevei, kevei@math.u-szeged.hu

Course name	Course code	Number of hours	Credit	Preliminary requirement
Semester 1				
Algorithms and Their Complexity	ME4151	2 + 2	6	
Applied Analysis	ME4131	2 + 2	6	
Differential Equations	ME4121	2 + 2	6	
Discrete Mathematics 2	ME4152	2 + 2	6	
Probability Theory	ME4161	3 + 2	7	
Total in Semester 1			**31**	
Semester 2				
Functional Analysis	ME4132	2 + 2	6	
Numerical Methods for Differential Equations	ME4122	2 + 2	6	Differential Equations
Statistical Analysis of Time Series	ME4162	2 + 2	6	Probability Theory
Stochastic Processes	ME4164	2 + 2	6	Probability Theory
Elective and optional courses			4	
Total in Semester 2			**28**	
Semester 3				
Principles of Economics	GKBN43	2 + 0	3	
Introduction to Finance	GKBN15	2 + 0	3	
Financial Mathematics and Ruin Theory	ME4165	2 + 2	6	Stochastic Processes
Elective and optional courses			8	
Diploma Project	ME4191	0 + 2	10	
Total in Semester 3			**30**	
Semester 4				
Optimization Methods	ME4153	2 + 2	6	
Mathematical Statistics	ME4163	2 + 2	6	Probability Theory
Microeconomics	GKBN04	2 + 2	3 + 2	Principles of Economics
Corporate Finance 1	GKBN38	1 + 1	2 + 2	Introduction to Finance
Degree Thesis	ME4192	0 + 2	10	
Total in Semester 4			**31**	

Elective courses

The table below contains the list of elective courses. Only those courses are considered elective courses that are not compulsory in the student's specialization.

Course name	Course code	Number of hours	Credit	Preliminary requirement
Group Theory	ME4111	2 + 2	6	
Advanced Algorithms	ME4112	3 + 0	4	
Semigroup Theory	ME4113	3 + 0	4	
Lattice Theory	ME4114	3 + 0	4	
Model Theory	ME4115	3 + 0	4	
Ordered sets	ME4116	3 + 0	4	
Fields and Galois Theory	ME4117	3 + 0	4	
Universal Algebra	ME4118	3 + 0	4	
Numerical Methods for Differential Equations	ME4122	2 + 2	6	Differential Equations
Nonliear Dynamics	ME4123	2 + 2	6	Differential Equations
Partial Differential Equations	ME4124	2 + 2	6	Differential Equations
Control Theory	ME4125	2 + 2	6	Differential Equations
Numerical Mathematics	ME4126	2 + 1	4	
Mathematical Data Science	ME4127	2 + 2	6	
Dynamic Modelling	ME4128	2 + 2	6	
Dynamic Modelling 2	ME4129	2 + 0	3	Dynamic Modelling
Banach Algebras and Operator Theory	ME4133	3 + 0	4	
Topology and Manifolds	ME4141	2 + 2	6	
Algebraic Topology	ME4142	3 + 0	4	
Asymptotic Geometric Analysis	ME4143	3 + 0	4	
Advanced Geometry	ME4144	3 + 0	4	
Integral Geometry	ME4145	3 + 0	4	
Combinatorics of Convex Polytopes	ME4146	3 + 0	4	
Brunn-Minkowski Theory of Convex Bodies	ME4147	3 + 0	4	
Extremal Graph Theory	ME4154	3 + 0	4	
Computational Models in Combinatorics	ME4155	3 + 0	4	
Mathematical Cryptography	ME4156	3 + 0	4	
Finite Geometry	ME4157	3 + 0	4	
Mathematical Statistics	ME4163	2 + 2	6	Probability Theory
Stochastic Processes	ME4164	2 + 2	6	Probability Theory
Financial Mathematics and Ruin Theory	ME4165	2 + 2	6	Stochastic Processes