

Appendices Master's degree programme Mathematics

Appendix A Teaching outcomes of the degree programme (art. 1.3)

The degree programme aims to train the students in such a way that they acquire the insight, skills and knowledge that allows the recipient of the degree to establish a professional career in the field of Mathematics.

Appendix B Specializations of the degree programme (art. 2.2)

The degree programme has the following specializations:

- Algebra and Geometry
- Dynamical Systems and Analysis
- Statistics and Probability
- Science, Business and Policy

Appendix C Content of the degree programme (art. 2.3)

The local Mathematics and Applied Mathematics modules are

module	offered	ECTS	assessment	practical
Algebra and Geometry	Yearly	5	Take home exam followed by an oral discussion of the problems	
Applied Geometry	Yearly	5	Assignment, oral presentation, report	
Boundary Layers	Every two year	5	Oral examination	x
Caput Dynamical Systems	Every two year	5	Oral presentation, essay	
Caput Mathematical Physics	Every two year	5	Oral presentation, essay	
Computational Engineering	Every two year	5	Assignments, oral presentation	
Computational Fluid Dynamics	Yearly	5	Assignments, oral examination	x
Contemporary Statistics with Applications	Every two year	5	Homework, final project, examination	
Dynamical Systems and Chaos	Yearly	5	Oral presentation, essay	

Final Research Project	Yearly	50	Assessment of performance, report, presentation	
Introduction to Optimization	Every two year	5	Take home exam followed by an oral discussion of the problems	
Modeling and Identification	Every two year	5	Take home exam followed by an oral discussion of the problems	
Robust Control	Yearly	5	Take home exam followed by an oral discussion of the problems	
Statistical Genomics	Every two year	5	Homework, final project, examination	
Student Colloquium	Yearly	5	Oral presentation	

From the total of 120 ECTS of the master programme at least 24 ECTS and at most 32 ECTS have to be chosen from the Mastermath programme.

For information on the modules of the Mastermath programme in 2009-2010 see <http://www.mastermath.nl>. The Mastermath programme of 2010-2011 will be announced in the spring of 2010. The programme of 2008-2009 gives an indication of the programme in 2010-2011.

For information on the modules of Social Sciences, the Arts, Physics, Astronomy, Econometrics and Computing Science see appendix C or D of the corresponding programme.

Specialization Algebra and Geometry

Core component (26 ECTS)

For students in the specialization Algebra and Geometry the following local modules are obligatory:

- Algebra and Geometry (5 ECTS)
- Applied Geometry (5 ECTS)

In addition, two modules have to be chosen from the modules in the specialization Algebra and Geometry of the Mastermath programme. In 2009-2010 Mastermath offers

- Riemann surfaces (8 ECTS)
- Analysis on Manifolds (with reservation, 8 ECTS)
- Algebraic Geometry (8 ECTS)
- Cryptology (8 ECTS)
- Elliptic Curves (8 ECTS)
- C^* -Algebras (8 ECTS)

- Topics in Number Theory: p-adic numbers and zeta functions (8 ECTS)

The Mastermath programma of 2010-2011 will be announced in the spring of 2010.

Enrichment Component (39 ECTS)

The following local module is obligatory:

- Student Colloquium (5 ECTS)

Approximately 18 ECTS to be chosen from the Mathematics (outside the specialization Algebra and Geometry) and Applied Mathematics modules offered locally or by Mastermath.

Recommended modules from the Mastermath programme are

- Continuous Optimization (6 ECTS)
- Discrete Optimization (6 ECTS)

Approximately 16 ECTS to be chosen from the modules of the master programme of Physics, Astronomy, Econometrics, Computing Science and Applied Mathematics, on individual approval of the Board of Examiners. At most 10 ECTS of these master modules can be replaced by advanced bachelor modules. Recommended modules are

- Relativiteit en Moderne Fysica (5 ECTS)
- General Relativity (5 ECTS)
- Cosmology (5 ECTS)
- Large Scale Structure of the universe (5 ECTS)

Free Choice (5 ECTS)

Optional module in any field taught at the university, on individual approval of the Board of Examiners.

Final Research Project (50 ECTS)

Research project in the specialization area Algebra and Geometry

Specialization Dynamical Systems and Analysis

From the total of 120 ECTS of the master programme at least 24 ECTS and at most 32 ECTS have to be chosen from the Mastermath programme.

Core component (31 ECTS)

For students in the specialization Dynamical Systems and Analysis the following local modules are obligatory:

- Dynamical Systems and Chaos (5 ECTS)
- Caput Dynamical Systems (5 ECTS)
- Caput Mathematical Physics (5 ECTS)

In addition, two modules have to be chosen from the modules in the specialization Dynamical Systems and Analysis of the Mastermath programme. In 2009-2010 Mastermath offers

- Functional Analysis (8 ECTS)
- Partial Differential Equations (8 ECTS)
- Analysis on Manifolds (with reservation, 8 ECTS)
- Dynamical Systems Generated by ODE and Maps (8 ECTS)

The Mastermath programme of 2010-2011 will be announced in the spring of 2010.

Enrichment Component (34 ECTS)

The following local module is obligatory:

- Student Colloquium (5 ECTS)

Approximately 15 ECTS to be chosen from the Mathematics (outside the specialization Dynamical Systems and Analysis) and Applied Mathematics modules offered locally or by Mastermath.

Approximately 14 ECTS to be chosen from the modules of the master programme of Physics, Astronomy, Econometrics, Computing Science and Applied Mathematics, on individual approval of the Board of Examiners. At most 10 ECTS of these master modules can be replaced by advanced bachelor modules.

A recommended module is

- Statistical Mechanics (5 ECTS)

Free Choice (5 ECTS)

Optional module in any field taught at the university, on individual approval of the Board of Examiners.

Final Research Project (50 ECTS)

Research project in the specialization area Dynamical Systems and Analysis.

Specialization Statistics and Probability

Core component (22-26 ECTS)

For students in the specialization Statistics and Probability the following local modules are obligatory:

- Statistical Genomics (5 ECTS)
- Contemporary Statistics with Applications (5 ECTS)

In addition, approximately 15 ECTS have to be chosen from the modules in the specialization Statistics and Probability of the Mastermath programme. In 2009-2010 Mastermath offers *Statistics*

- Asymptotic Statistics (8 ECTS)
- Applied Statistics (8 ECTS)
- Time Series (8 ECTS)

Probability

- Introduction to Stochastic Processes (4 ECTS)
- Stochastic Processes (8 ECTS)
- Measure Theoretic probability (8 ECTS)
- Stochastic Differential Equations (6 ECTS)
- Queuing theory (6 ECTS)

The Mastermath programme of 2010-2011 will be announced in the spring of 2010.

Enrichment Component

(39 – 43 ECTS, the Core and Enrichment Component must have a total of 65 ECTS)

The following local module is obligatory:

- Student Colloquium (5 ECTS)

Approximately 18 ECTS to be chosen from the Mathematics (outside the specialization Statistics and Probability) and Applied Mathematics modules offered locally or by Mastermath.

Approximately 18 ECTS to be chosen from the modules of the master programme of Social Sciences, the Arts, Physics, Astronomy, Econometrics, Computing Science and Applied Mathematics, on individual approval of the Board of Examiners. At most 10 ECTS of these master modules can be replaced by advanced bachelor modules. Recommended modules are

- Experimental Design and ANOVA (5 ECTS)
- Stochastic Models (6 ECTS)
- Machinaal Leren (5 ECTS)

- Applied Statistics for Econometrics (10 ECTS)
- Multivariate Data Analysis (10 ECTS)
- Factor Analysis (5 ECTS)
- Statistiek 4 (5 ECTS)
- Applied Statistics (5 ECTS)
- Multivariate Statistiek (4 ECTS)
- Statistical Mechanics (5 ECTS)
- Statistical Methods in Physics (5 ECTS)
- DNA Microarray Analysis (5 ECTS)
- Multilevel Analysis (5 ECTS)
- Generalized Linear Models (5 ECTS)
- Statistische Fysica (5 ECTS)
- Meth. and Statistics Ling. Research (10 ECTS)
- Statistiek 3 (5 ECTS)

Free Choice (5 ECTS)

Optional module in any field taught at the university, on individual approval of the Board of Examiners.

Final Research Project (50 ECTS)

Research project in the specialization area Statistics and Probability.

Specialization Science, Business and Policy

Mathematical Component (30 ECTS)

To be chosen from the master Mathematics modules offered locally or by Mastermath. The requirement on the programme that at least 24 ECTS have to be chosen from the Mastermath programme does not hold for this specialization.

Mathematical Research Project (30 ECTS)

Research Project in one of the specializations Algebra and Geometry, Dynamical Systems and Analysis, Statistics and Probability.

Module Science, Business and Policy (20 ECTS)

Internship Science, Business and Policy (40 ECTS)

module	ECTS	assessment	practical
Science, Business and Policy	20	Assignment, exam	
Mathematical Research Project	30	Assessment of performance, report, presentation	
Internship Science, Business and Policy	40	Assessment of performance, reports	

Appendix D Optional modules (art. 2.4)

See Appendix C.

Appendix E Entry requirements and compulsory order of examinations (art. 3.2)

For students admitted to the programme there are no entry requirements for the individual modules.

Appendix F Admission to the degree programme and different specializations (art. 4.1.1 + art. 4.2)

Holders of the following Bachelor's degree from the University of Groningen are considered to have sufficient knowledge and skills and will be admitted to the Master's degree programme in Mathematics on that basis:

- BSc Mathematics
- BSc Applied Mathematics

Appendix G Application deadlines for admission (art. 4.5)

Deadlines for application are:

- June 1st 2009 for EU student
- April 15th 2009 for non-EU students