AALBORG UNIVERSITET

MSC IN MATHEMATICS, 2017

MASTER OF SCIENCE (MSC)
AALBORG

Link to this studyline

Link(s) to other versions of the same line:

MSc in Mathematics, 2018

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§ 1: PREFACE

Pursuant to Act 261 of March 18, 2015 on Universities (the University Act) with subsequent changes, the following curriculum is established. The programme also follows the Joint Programme Regulations and the Examination Policies and Procedures for The Faculty.

§ 2: BASIS IN MINISTERIAL ORDERS

The Master's programme is organised in accordance with the Ministry of Higher Education and Science's Order no. 1328 of November 15, 2016 on Bachelor's and Master's Programmes at Universities (the Ministerial Order of the Study Programmes) and Ministerial Order no. 1062 of June 30, 2016 on University Examinations (the Examination Order). Further reference is made to Ministerial Order no. 111 of January 30, 2017 (the Admission Order) and Ministerial Order no. 114 of February 3, 2015 (the Grading Scale Order) with subsequent changes.

§ 3: CAMPUS

The programme is offered in Aalborg.

§ 4: FACULTY AFFILIATION

The Master's programme falls under The Faculty of Engineering and Science, Aalborg University.

§ 5: STUDY BOARD AFFILIATION

The Master's programme falls under Study Board of Mathematical Sciences

§ 6: AFFILIATION TO CORPS OF EXTERNAL EXAMINERS

The Master's programme is associated with the external examiners corps on Mathematics.

(Censorkorpset for matematik)

§ 7: ADMISSION REQUIREMENTS

Applicants with a legal claim to admission (retskrav):
Applicants with one of the following degrees are entitled to admission:

- Bachelor of Science (BSc) in Mathematics, Aalborg University

Applicants without legal claim to admission:

- Bachelor of Science (BSc) in Mathematics, Aarhus University (AU)
- Bachelor of Science (BSc) in Mathematics, Copenhagen University (KU)
- Bachelor of Science (BSc) in Mathematics, Southern Danish University (SDU)

§ 8: THE PROGRAMME TITLE IN DANISH AND ENGLISH

The Master's programme entitles the graduate to the Danish designation Cand.scient. i matematik. The English designation is: Master of Science (MSc) in Mathematics.

Or

Cand.scient. (candidatus/candidata scientiarum) i matematik og [sidefag]. The English designation is: Master of Science (MSc) in Mathematics and [Minor Subject].

§ 9: PROGRAMME SPECIFICATIONS IN ECTS CREDITS

The Master's programme is a 2-year, research-based, full-time study programme. The programme is set to 120 ECTS credits.

§ 10: RULES CONCERNING CREDIT TRANSFER (MERIT), INCLUDING THE POSSIBILITY FOR CHOICE OF MODULES THAT ARE PART OF ANOTHER PROGRAMME AT A UNIVERSITY IN DENMARK OR ABROAD

The Study Board can approve successfully completed (passed) programme elements from other Master's programmes in lieu of programme elements in this programme (credit transfer). The Study Board can also approve successfully completed (passed) programme elements from another Danish programme or a programme outside of Denmark at the same level in lieu of programme elements within this curriculum. Decisions on credit transfer are made by the Study Board based on an academic assessment. See the Joint Programme Regulations for the rules on credit transfer.

§ 11: EXEMPTIONS

In exceptional circumstances, the Study Board study can grant exemption from those parts of the curriculum that are not stipulated by law or ministerial order. Exemption regarding an examination applies to the immediate examination.

§ 12: RULES FOR EXAMINATIONS

The rules for examinations are stated in the Examination Policies and Procedures - published at this website: https://www.studieservice.aau.dk/Studielegalitet/

§ 13: RULES CONCERNING WRITTEN WORK, INCLUDING THE MASTER'S THESIS

In the assessment of all written work, regardless of the language it is written in, weight is also given to the student's formulation and spelling ability, in addition to the academic content. Orthographic and grammatical correctness as well as stylistic proficiency are taken as a basis for the evaluation of language performance. Language performance must always be included as an independent dimension of the total evaluation. However, no examination can be assessed as 'Pass' on the basis of good language performance alone; similarly, an examination normally cannot be assessed as 'Fail' on the basis of poor language performance alone.

The Study Board can grant exemption from this in special cases (e.g., dyslexia or a native language other than Danish).

The Master's Thesis must include an English summary (or another foreign language: French, Spanish or German upon approval by the Study Board). If the project is written in English, the summary must be in Danish (The Study Board can grant exemption from this). The summary must be at least 1 page and not more than 2 pages (this is not included in any fixed minimum and maximum number of pages per student). The summary is included in the evaluation of the project as a whole.

§ 14: REQUIREMENTS REGARDING THE READING OF TEXTS IN A FOREIGN LANGUAGE

It is assumed that the student can read academic texts in his or her native language as well as in English and use reference works etc. in other European languages.

§ 15: COMPETENCE PROFILE ON THE DIPLOMA

The following competence profile will appear on the diploma:

A Candidatus graduate has the following competency profile:

A Candidatus graduate has competencies that have been acquired via a course of study that has taken place in a research environment.

A Candidatus graduate is qualified for employment on the labour market based on his or her academic discipline as well as for further research (PhD programmes). A Candidatus graduate has, compared to a Bachelor, developed his or her academic knowledge and independence so as to be able to apply scientific theory and method on an independent basis within both an academic and a professional context.

§ 16: COMPETENCE PROFILE OF THE PROGRAMME

Students graduating as Masters of Mathematics

Knowledge

- are well-oriented in the foundations of key mathematical disciplines including mathematical analysis, algebra, geometry, probability and statistics

Skills

- are able to independently identify, formulate and analyse mathematical problems employing theory and methodology from the mathematical sciences
- are able to independently choose relevant methods and tools from various mathematical areas and to motivate this choice
- are able to disseminate scientific knowledge and to discuss applications of methods from the mathematical sciences

Competencies

- are able to ponder about central mathematical insights, methods and tools and to identify problems amenable to mathematical treatment
- are able to manage complex work and development scenarios that may require new strategies in order to make progress
- are able to independently take responsibility for professional development and specialization

Moreover, graduates within Applied Mathematics

Knowledge

- have acquired a profound understanding within one or a few mathematical areas linking up to international research level

Skills

- can apply techniques of mathematical modelling to theories and problems originating in scientific areas from outside of Mathematics
- are able to choose relevant mathematical theories to problems that originate in, for example, engineering, computer science or economics, to develop them and to make use of them in the original applied context

Competencies

- are able to launch and to perform professional and responsible scientific collaboration with peers from within and from outside of Mathematics

Moreover, students graduating in Mathematics in combination within a second subject

Knowledge

- have acquired a broad view into mathematical theories and methods within several mathematical areas and their mutual connections

Skills

- are able to disseminate scientific knowledge to non-experts and to reflect about best practices how to achieve good understanding

Competencies

- are able to identify requirements for their further development of scientific knowledge and methodology and to structure ways of achieving requested insights

§ 17: STRUCTURE AND CONTENTS OF THE PROGRAMME

The programme is structured in modules and organized as a problem-based study. A module is a programme element or a group of programme elements, which aims to give students a set of professional skills within a fixed time frame specified in ECTS credits, and concluding with one or more examinations within specific exam periods. Examinations are defined in the curriculum. The programme is based on a combination of academic, problem-oriented and interdisciplinary approaches and organized based on the following work and evaluation methods that combine skills and reflection:

- lectures
- classroom instruction
- project work
- workshops

- exercises (individually and in groups)
- teacher feedback
- reflection
- portfolio work

Overview of the programmes:
All modules are assessed through individual grading according to the 7-point scale or Pass/Fail. All modules are assessed by external examination (external grading) or internal examination (internal grading or by assessment by the supervisor only).

General provisions concerning elective courses:
- Only a limited number of elective courses from the list of courses will be offered at each semester.

- The study board can cancel modules if the nuymber of enrolled students is low.

- Students can only participate once in a course with a given title. In particular, they cannot follow a course if they have previously participated in a course with the same title as part of a bachelor programme.

§ 18: OVERVIEW OF THE PROGRAMME

Students can participate only once in a course with a given title. In particular, they cannot follow a course if they have previously participated in a course with the same title as part of a bachelor programme.

All modules are assessed through individual grading according to the 7-point scale or Pass/Fail. All modules are assessed by external examination (external grading) or internal examination (internal grading or by assessment by the supervisor only).

On the 7'th, 8'th and 9'th semester the student may follow courses from different curricula e.g. engineering or computer science, as decribed in the requirements for Applied Mathematics.

Offered as: 1-professional Study programme: Applied Mathematics					
Module name	Course type	ECTS	Applied grading scale	Evaluation method	Assessment method
1 SEMESTER					
Introductory Application Oriented Mathematics	Project	15	7-point grading scale	External examination	Oral exam based on a project
1. semester/MAT7 elective courses	Course	15			
2 SEMESTER					
Intermediate Application Oriented Mathematics	Project	15	7-point grading scale	Internal examination	Oral exam based on a project
2. semester/MAT8 elective courses	Course	15			
3 SEMESTER					
Advanced Application Oriented Mathematics	Project	20	7-point grading scale	Internal examination	Oral exam based on a project
3. semester/MAT9 elective courses	Course	10			
3-4 SEMESTER					
Long Master's Thesis, 60 ECTS	Project	60	7-point grading scale	External examination	Oral exam based on a project
4 SEMESTER					

Master's Thesis. 30 ECTS	Project	30	7-point grading scale	External examination	Oral exam based on a project

Long Master's thesis

The long Master's thesis, which must be of experimental character, is propared in the 3'rd and 4'th semesters; the extent is 60 ECTS.

Study abroad

On the 3'rd semester the student also has the possibility to study at another Danish or international university (study abroad). Study at another university must be approved by the Study Board.

1. semester/MAT7 elective courses

Module name	Course type	ECTS	Applied grading scale	Evaluation Method	Assessment method
Introduction to Partial Differential Equations	Course	5	Passed/Not Passed	Internal examination	Written or oral exam
Numerical Analysis	Course	5	Passed/Not Passed	Internal examination	Oral exam
Manifolds – Differential Geometry and Topology	Course	5	Passed/Not Passed	Internal examination	Written or oral exam
Optimization	Course	5	7-point grading scale	External examination	Written or oral exam
Measure Theory and Stochastic Processes	Course	5	Passed/Not Passed	Internal examination	Written or oral exam
Statistics for Duration Data	Course	5	Passed/Not Passed	Internal examination	Active participation/continuous evaluation
Topics in Statistical Sciences I	Course	5	7-point grading scale	Internal examination	Written or oral exam
Topics in Statistical Science II	Course	5	7-point grading scale	Internal examination	Written or oral exam
Information and Coding Theory	Course	5	7-point grading scale	Internal examination	Written or oral exam

2. semester/MAT8 elective courses

Module name	Course type	ECTS	Applied grading scale	Evaluation Method	Assessment method
Bayesian Inference and Mixed Models	Course	5	Passed/Not Passed	Internal examination	Active participation/continuous evaluation
Time Series and Econometrics	Course	5	7-point grading scale	Internal examination	Written or oral exam
Spatial Statistics and Markov Chain Monte Carlo Methods	Course	5	Passed/Not Passed	Internal examination	Written or oral exam
Graph Theory	Course	5	Passed/Not Passed	Internal examination	Written or oral exam
Coding Theory	Course	5	Passed/Not Passed	Internal examination	Written or oral exam

Applied Harmonic Analysis	Course	5	Passed/Not Passed	Internal examination	Oral exam
Operators on Hilbert Spaces	Course	5	Passed/Not Passed	Internal examination	Written or oral exam
Algebraic Topology	Course	5	Passed/Not Passed	Internal examination	Written or oral exam
Quantitative Finance and Computational Statistics	Course	5	Passed/Not Passed	Internal examination	Written or oral exam
Financial Engineering	Course	5	Passed/Not Passed	Internal examination	Written or oral exam
Data Mining	Course	5	Passed/Not Passed	Internal examination	Written or oral exam

3. semester/MAT9 elective courses					
Module name	Course type	ECTS	Applied grading scale	Evaluation Method	Assessment method
Introduction to Partial Differential Equations	Course	5	Passed/Not Passed	Internal examination	Written or oral exam
Numerical Analysis	Course	5	Passed/Not Passed	Internal examination	Oral exam
Manifolds – Differential Geometry and Topology	Course	5	Passed/Not Passed	Internal examination	Written or oral exam
Optimization	Course	5	7-point grading scale	External examination	Written or oral exam
Measure Theory and Stochastic Processes	Course	5	Passed/Not Passed	Internal examination	Written or oral exam
Statistics for Duration Data	Course	5	Passed/Not Passed	Internal examination	Active participation/continuous evaluation
Topics in Statistical Sciences I	Course	5	7-point grading scale	Internal examination	Written or oral exam
Topics in Statistical Science II	Course	5	7-point grading scale	Internal examination	Written or oral exam
Topics in Algebraic Geometry and Commutative Algebra	Course	5	Passed/Not Passed	Internal examination	Written or oral exam
Topics in Applied Mathematical Analysis and Geometry	Course	5	Passed/Not Passed	Internal examination	Written or oral exam

Mathematics as a central subject in combination with a minor subject. Tofagsuddannelse med matematik som centralt fag, gymnasielærer.

Example: NAT as a minor subject (for example Biology as a minor subject) The student has followed 60 ECTS on the minor subject at the bachelor level.
Individual plans must be approved by the two Study Boards involved.

Offered as: 2-professional Study programme: Major subject Mathematics, minor subject NAT					
Module name	Course type	ECTS	Applied grading scale	Evaluation method	Assessment method

1 SEMESTER					
Statistical Modelling and Analysis	Project	15	7-point grading scale	External examination	Oral exam based on a project
Statistical Inference for Linear Models	Course	5	Passed/Not Passed	Internal examination	Active participation/continuous evaluation
Computeralgebra	Course	5	Passed/Not Passed	Internal examination	Written or oral exam
Differential Geometry	Course	5	7-point grading scale	Internal examination	Written or oral exam
2 SEMESTER					
Mathematics with Applications	Project	15	7-point grading scale	External examination	Oral exam based on a project
Integration Theory	Course	5	7-point grading scale	External examination	Written or oral exam
2. semester/MAT8 elective courses					
4 SEMESTER					
Master's Thesis. 30 ECTS	Project	30	7-point grading scale	External examination	Oral exam based on a project

Mathematics as a minor subject in combination with central subject
Tofagsuddannelse med matematik som sidefag, gymnasielærer.

Example: NAT central subject (for example Biology as a central subject). The student has followed 60 ECTS mathematics on the bachelor level.
Individual plans must be approved by the two Study Boards involved.

Offered as: 2-professional Study programme: Minor subject Mathematics, major subject NAT (draft version)					
Module name	Course type	ECTS	Applied grading scale	Evaluation method	Assessment method
3 SEMESTER					
Statistical Modelling and Analysis	Project	15	7-point grading scale	External examination	Oral exam based on a project
Statistical Inference for Linear Models	Course	5	Passed/Not Passed	Internal examination	Active participation/continuous evaluation
Computeralgebra	Course	5	Passed/Not Passed	Internal examination	Written or oral exam
Differential Geometry	Course	5	7-point grading scale	Internal examination	Written or oral exam

EXAMPLE: HUM/SAMF/IDRÆT central subject. The student has followed 45 ECTS mathematics on the bachelor level.
Individual plans must be approved by the two Study Boards involved.

Offered as: 2-professional Study programme: Minor subject Mathematics, major subject HUM/SAMF/Idræt (draft version)

Module name	Course type	ECTS	Applied grading scale	Evaluation method	Assessment method
1 SEMESTER					
Ordinary Differential Equations	Project	15	7-point grading scale	Internal examination	Oral exam based on a project
Analysis 1	Course	5	7-point grading scale	External examination	Written or oral exam
Linear Algebra with Applications	Course	5	7-point grading scale	Internal examination	Written or oral exam
Algebra 1: Groups	Course	5	7-point grading scale	Internal examination	Written or oral exam
2 SEMESTER					
Symmetry	Project	10	7-point grading scale	External examination	Oral exam based on a project
Probability Theory	Course	5	7-point grading scale	Internal examination	Written or oral exam
Analysis 2	Course	5	7-point grading scale	Internal examination	Written or oral exam
Algebra 2: Rings and Fields	Course	5	7-point grading scale	External examination	Written or oral exam
Mathematics as a minor subject, master level. Elective courses on MAT4					
3 SEMESTER					
Statistical Inference for Linear Models	Course	5	Passed/Not Passed	Internal examination	Active participation/continuous evaluation
Computeralgebra	Course	5	Passed/Not Passed	Internal examination	Written or oral exam
Differential Geometry	Course	5	7-point grading scale	Internal examination	Written or oral exam

Mathematics as a minor subject, master level. Elective courses on MAT4					
Module name	Course type	ECTS	Applied grading scale	Evaluation Method	Assessment method
Complex Functions	Course	5	Passed/Not Passed	Internal examination	Active participation/continuous evaluation
The Didactics of Mathematics	Course	5	Passed/Not Passed	Internal examination	Active participation/continuous evaluation

§ 19: ADDITIONAL INFORMATION

All students who have not participated in Aalborg University's PBL introductory course during their Bachelor's degree must attend the introductory course "Problem-based Learning and Project Management". The introductory course must be approved before the student can participate in the project exam. For further information, please see the School of Engineering and Science' website.

§ 20: COMMENCEMENT AND TRANSITIONAL RULES

The curriculum is approved by the dean and enters into force as of 01.09.2017.

Students who wish to complete their studies under the previous curriculum from 2016 must conclude their education by the summer examination period 2018 at the latest, since examinations under the previous curriculum are not offered after this time.

§ 21: AMENDMENTS TO THE CURRICULUM AND REGULATIONS