UiT The Arctic University of Norway

Programme description
Mathematical Sciences – master

120 ECTS/ Campus Tromsø

The programme description has been approved by the Faculty Board at the Faculty of Science and Technology on 08.10.2020.

Study programme name	Mathematical Sciences – master Matematiske fag – master (norsk) Matematiske fag – master (nynorsk)
Degree obtained	Master of Science in Mathematical Sciences
Target group	The master´s programme in Mathematics Sciences is aimed at well-qualified students with a Bachelor of Science degree or equivalent in mathematics, statistics or physics from both Norwegian and international universities. The study programme will give students an introduction to mathematical research and the opportunity to specialize in various mathematical and statistical topics.
Admission requirements, required prerequisite, recommended prerequisite knowledge	Admission to the program requires a Bachelor of Science in mathematics, statistics, physics or another degree following a program of study of at least three years, or similar education approved in accordance with the “University and university colleges act” section 3-4. The education must contain a specialization in mathematics and/or statistics corresponding to at least 80 ECTS. An average mark of "C" or better is required in the bachelor's degree or similar basis of admission.
The study programme’s Learning Outcome	*After completing the study programme, the candidate will have achieved the following learning outcomes:* *Knowledge* *The candidate..* • has advanced knowledge within mathematical areas such as statistics, algebra, geometry or applied mathematics • has solid knowledge about fields close to the chosen main area • has sufficient knowledge of mathematics to teach in senior high school • has solid knowledge about fields close to mathematics and statistics, such as physics or computer science • has thorough knowledge of mathematical or statistical methods in theory and practice and can analyze academic problems on the basis of traditions in the academic field • can apply mathematical or statistical methods in new areas of natural and social science

Skills

The candidate..

- can enter complicated problem issues, uncover structures and formulate precise problems, find suitable analytical and/or numerical solution methods, and interpret the solutions
- has good practical skills in using relevant programming tools
- can use existing literature in an active way to understand the work of other scientists, and as support to solve own mathematical problems
- can use mathematical or statistical methods in theory and practice, and make an independent judgment of the applicability of theory and models for a given problem
- can carry out an independent, limited research project under supervision and in accordance with applicable norms for research ethics in the mathematical sciences

General Competence

The candidate..

- has solid knowledge of a broad variety of mathematical and statistical methods and techniques for analysis and problem solving
- has acquired good theoretical insight and the ability to apply mathematical theory, methods and techniques to solve problems
- possesses necessary qualifications for work within industry, technology, science, information technology, and schools.
- can apply knowledge within mathematics and statistics on problems and questions arising within social and natural sciences
- can cooperate in an interdisciplinary way with other specialists
- can find precise and scientific formulations, in oral and written language
- can do independent scientific work and formulate the contents of the work within the framework of the terminology of mathematics and statistics
- can make knowledge-based judgments on general scientific issues and communicate these in public.
- can contribute to new thinking and innovation processes in the field of mathematics and statistics

Academic content and description of the study programme	The academic contents of the program are geared towards modern issues in mathematics and statistics, and towards the appliance of mathematics and statistics in technology and other natural sciences. The candidates will gain relevant skills within programming, data processing, analytical problem solving and quantitative analysis. The master´s programme consists of a master's thesis of 60 ECTS, 20-40 ECTS in specialization courses (courses at 3000-level in mathematics or statistics), up to 20 ECTS in elective courses (relevant and scientific courses on 2000 or 3000-level), and 20 ECTS in the mandatory courses MAT-3001 «Introduction to mathematical research 1» and MAT-3002 «Introduction to mathematical research 2». No more than 20 ECTS at the 2000-level can be included in the degree. In their first two semesters, the students will take the courses MAT-3001 and MAT-3002. In these courses, the students will prepare for research and development in the mathematical sciences through seminars, projects, and group work. Innovation in Mathematics and Statistics will also be covered in these courses. MAT-3001 consists of two blocks, where the first part covers scientific communication and practice, focusing on the traditions in mathematics and statistics, using selected topics in the fields. The second part consist of individual projects that, if possible, are related to the specialization courses that the students take in the first semester. MAT-3002 covers core techniques in mathematics and statistics, including problem-solving strategies, numerical and symbolic computation, and statistical approaches. The courses MAT-3001 and MAT-3002 provide the generic learning outcomes in the program. Advanced knowledge and skills are covered through specialized courses. It is mandatory to take one of the following specialization courses in the first semester: MAT-3300 Algebra 2 MAT-3110 Differential Geometry MAT-3200 Mathematical Methods STA-3002 Multivariable Statistical AnalysisIn the second semester it is mandatory to take one for the following specialization courses: MAT-3303 Algebraic Geometry MAT-3111 Differential Geometry 2 MAT-3202 Nonlinear Waves MAT-3213 Climate Dynamics STA-3001 Computer-intensive Statistics.

Some first-semester specialization courses are prerequisites for specialization courses in the second semester. Examples of suitable course combinations are provided below. The specialization must consist of at least two 3000-level courses in mathematics, or at least two 3000-level courses in statistics.

The elective courses must be considered scientific courses, at 2000 or 3000 level.

The program is primarily a full-time program, over 2 years. Adjustments can be made for part-time students. Attendance during lectures and seminars is required. All courses will be given at campus Tromsø.

Courses from other Universities, both national and international can be included in the study program.

Table: programme structure

Semester	10 ECTS	10 ECTS	10 ECTS
1. sem (fall)	MAT-3001 Introduction to mathematical research 1	Specialization*	Elective/specialization
2. sem (Spring)	MAT-3002 Introduction to mathematical research 2	Specialization**	Elective/specialization
3. sem (fall)	Thesis		
4. sem (Spring)			

* MAT-3300 Algebra 2, MAT-3110 Differential Geometry, MAT-3200 Mathematical Methods, or STA-3002 Multivariable Statistical Analysis

** MAT-3303 Algebraic Geometry, MAT-3111 Differential Geometry 2, MAT-3202 Nonlinear Waves, MAT-3213 Climate Dynamics, STA-3001 Computer-intensive Statistics

Example of course combinations for students with interests in applied mathematics

Semester	10 ECTS	10 ECTS	10 ECTS
1. sem (fall)	MAT-3001 Introduction to mathematical research 1	MAT-3200 Mathematical Methods	Elective

2. sem (Spring)	MAT-3002 Introduction to mathematical research 2	MAT-3202 Nonlinear Waves	MAT-3213 Climate Dynamics
3. sem (fall)	Thesis		
4. sem (Spring)			

Example of course combinations for students with interests in differential geometry

Semester	10 ECTS	10 ECTS	10 ECTS
1. sem (fall)	MAT-3001 Introduction to mathematical research 1	MAT-3300 Algebra 2	MAT-3110 Differential Geometry
2. sem (Spring)	MAT-3002 Introduction to mathematical research 2	MAT-3111 Differential Geometry 2	Elective
3. sem (fall)	Thesis		
4. sem (Spring)			

Example of course combinations for students with interests in algebra

Semester	10 ECTS	10 ECTS	10 ECTS
1. sem (fall)	MAT-3001 Introduction to mathematical research 1	MAT-3300 Algebra 2	Elective
2. sem (Spring)	MAT-3002 Introduction to mathematical research 2	MAT-3303 Algebraic Geometry	Elective
3. sem (fall)	Thesis		

	4. sem (Spring)	

Example of course combinations for students with interests in statistics

Semester	10 ECTS	10 ECTS	10 ECTS
1. sem (fall)	MAT-3001 Introduction to mathematical research 1	STA-3002 Multivariable Statistical Analysis	Elective
2. sem (Spring)	MAT-3002 Introduction to mathematical research 2	STA-3001 Computer-intensive Statistics	Elective
3. sem (fall)	Thesis		
4. sem (Spring)			

Learning activities, examination and assessment	The study program mainly consists of ordinary courses at master level (3000 level), special curriculums and some 2000-level courses. The courses offer a variety of curricular approaches. Courses in the program have lectures and seminars, where theory and curricular themes are discussed with exercises. Written hand-ins are mandatory for most ordinary courses. The basis for the teaching methods in all courses are relevant and current research and experience-based knowledge. The courses MAT-3001 and MAT-3002 will give students knowledge about scientific theory and methods and train them in critical thinking and problem-solving. The courses in the program are evaluated in different ways; written exam, oral exam, or written home assignment. An oral exam is most common for 3000-level courses. The details of the way the courses are evaluated are found in the course descriptions. The Master's thesis is an independent piece of scientific work, but students are allowed to write together in small groups of no more than 3 students. The Master´s thesis is assessed by a committee based on the thesis itself, an oral presentation of the thesis and an oral exam.
The study programme's relevance	Through the program, the students will acquire broad competence that qualifies them for work in different areas and sectors. They train in problem-solving using systematic and analytical methods, which

	will make them attractive candidates for research, development, management, and the public and private sectors. There are development and innovation projects that require competence in the mathematical sciences in renewable energy, climate adaptation, information technology, economics, insurance, finance and banking, biotechnology, and medical technology. In the public sector, there is a demand for mathematicians and statisticians in all technical agencies and natural and environmental management. In the private sector, there is an increasing need for personnel who can process and analyze data, and our society sees a growing demand for competence in modeling and analyzing complex problems within different sectors and fields. The study program also qualifies for PhD studies, for instance the PhD program in Science at UiT.
Work scope	The program consists of 120 ECTs. Full-time students are expected to work 40 hours per week, corresponding to 1500-1800 hours per year.
For master's theses/independent work in master's degrees	The students complete a master thesis (60 ECTs) that consists of an individual research project with assistance from a supervisor. Detailed information about the master thesis can be found in the regulations for master theses at the Faculty of Science and Technology. Master theses are graded with letters from A to F. Students are allowed to work together in small groups of no more than 3 student.
Language of instruction and examination	Instruction and examination is given in English
Internationalization	Mathematics and statistics are international subjects, and the students will meet teachers, guest lecturers, and course material from different countries. The study program is an English program, so the students will be an International class.
Student exchange	Exchange with other Norwegian or foreign institutions is encouraged in the two first semester. Several exchange agreements and stipend arrangements are available at UiT. The Department has several exchange agreements that are suitable for Master students. For more information and an overview of all exchange agreements, see UiT's student exchange webpage: https://uit.no/utdanning/studentutveksling The program board must preapprove the planned courses at external institutions. We recommend an exchange stay in the second semester. The mandatory course MAT-3002 can be exchanged with another relevant course at the exchange University, or the students can follow this course digitally and take 20 credits at the exchange University.

Supervised professional training	The program does not include supervised professional training.
Administrative responsibility and academic responsibility	The Department of Mathematics and Statistics has administrative responsibility for the program. The study program has a program board responsible for quality assurance and for managing questions related to the study program. Students are represented in the program board.
Quality assurance	The program will be evaluated in accordance with the System for Quality in Education at UiT – The Arctic University of Norway and the Faculty of Science and Technology regulations. The Department of Mathematics and the program board are responsible for the evaluation. Every class selects representatives to speak on behalf of the students in matters concerning the quality of the program.
Other regulations	The regulations for master theses at the Faculty of Science and Technology provides additional details.