Linnæus University

Jnr: 2014/187-3.1.1

Programme syllabus

Faculty of Technology

Matematikerprogrammet, 180 högskolepoäng
Applied Mathematics Programme, 180 credits

Level
First Level

Date of Ratification
Approved 2009-03-26
Revised 2014-01-24 by the Faculty Board within the Faculty of Technology
The programme syllabus is valid from autumn semester 2014

Prerequisites
General entry requirements and Physics B, Mathematics D or Mathematics 4, Physics 2.

Description of Programme

The Applied Mathematics Programme is a bachelor programme with Mathematics as main subject.
An overall idea for the programme is that with sound knowledge in mathematics and good practice in programming the students are well prepared for deeper studies in applied mathematics. Knowing a related subject increases the attractivity of the mathematician on the labor market.

Fields where mathematicians are in demanded are for example information security, manufacturing engineering, actuarial mathematics, design of experiments and statistic survey.
The program can also be considered as the first step towards a career in mathematics with the primary aim to obtain an advanced degree and then continue to work as a senior lecturer in mathematics.

The program can be studied in English.
However, some optional courses can be offered in Swedish only.

Objectives

Knowledge and understanding

For a Degree of Bachelor students must
- demonstrate knowledge and understanding in their main field of study, including knowledge of the scientific basis of the field, knowledge of applicable methods in the field, in-depth knowledge of some part of the field and a general sense of current research issues.

Skills and abilities

For a Degree of Bachelor students must

- demonstrate an ability to seek, gather and critically interpret information that is relevant to a problem and to critically discuss phenomena, issues and situations;
- demonstrate an ability to independently identify, formulate and solve problems and to perform tasks within specified time limits;
- demonstrate an ability to present and discuss information, problems and solutions in dialogue with different groups, orally and in writing; and
- demonstrate the skills required to work independently in the field that the education concerns.

Judgement and approach

For a Degree of Bachelor students must
- demonstrate an ability to make assessments in their main field of study, taking into account relevant scientific, social and ethical aspects;
- demonstrate insight into the role of knowledge in society and into people's responsibility for how knowledge is used; and
- demonstrate an ability to identify their need of further knowledge and to upgrade their capabilities.

Programme specific goals
Knowledge and understanding
For the degree of Bachelor, the student should:
- show knowledge and understanding within the main field of Mathematics and Applied Mathematics
Skills and ability
For the degree of Bachelor the student should:
• show the ability to critically and systematically integrate knowledge in Mathematics and Applied Mathematics and analyse Mathematical models in fields of application such as Computer Science, Technology/Physics, and Economics
• show the ability to critically, independently and creatively, identify problem issues within fields of application such as Computer Science, Economics or Technology/Physics and be able to build mathematical models for them
Judgement and Approach
For the degree of Bachelor, the student should
• show the ability within Mathematics and Applied Mathematics to make evaluations with respect to relevant scientific, social, and ethical aspects.

Content

Programme Overwiew

The degree programme comprises of 180 credits and includes a final Bachelor's degree project which comprises of 15 credits.

Besides courses in pure mathematics, courses in mathematical modeling, numerical methods, programming and statistics are given. Also in the math courses modern software is used; it will gives a deeper understanding for the subject. In three courses the student will learn the mathematical methods in economy, encryption and mechanics. During the third and last year there is a choice between deeper studies in an application field or higher studies in mathematics.

During the programme, the progression of the students is followed up both concerning the individual courses and the whole programme, and the progression is evaluated against the aims of the objectives.

Programme courses

Year 1 (Autumn term)

- Basic Mathematics, 7.5 credits (G1N) *The purpose of the course is to give an

introduction in the field of mathematics and give the student a platform for higher studies in mathematics.
- Mathematical modelling 1, 7.5 credits (G1N) *The purpose of the course is to show how you can build mathematical models to understand complex systems.
- Vector geometry, 7.5 credits (G1F) *The purpose of the course is to give an introduction to vectors, matrices and linear algebra in the plane and 3-space.
- Programming, 7.5 credits (G1N) The purpose of the course is to give an introduction to object oriented programming techniques in the language Java.

Year 1 (Spring term)

- Calculus 1, 7.5 credits (G1N) * The purpose of the course is to give a sound knowledge of integral and differential calculus.
- Calculus 2, 7.5 credits (G1F) * The purpose of the course is to deepen the knowledge of analysis.
- Programming and data structures, 7.5 credits (G1N)The purpose of the course is to deepen the knowledge in object oriented modelling (e.g. inheritance and polymorphism) and give an introduction to algorithms and data structures.
- Discrete Mathematics, 7.5 credits (G1F) *The purpose of the course is to present a number of mathematical areas where finite processes are used as combinatorics, recursion relations and graph theory.

Year 2 (Autumn term)

- Probability theory and statistics, 7.5 credits (G1F) *The purpose of the course is to introduce central concepts as stochastic variables, distribution functions, expectation values, conditional probability and the central limit theorem.
- Numerical methods, 7.5 credits (G1F) *The purpose of the course is to introduce methods for numerical solutions of mathematical problems and analyse their theoretical and computational properties.
- Mathematics in Economy, 7.5 credits (G1F) * The purpose of the course is to introduce the mathematical methods in economy.
- Stochastic processes, 7.5 credits (G1F) *The purpose of the course is to deepen the knowledge about probability theory and their applications, especially Markov processes in discrete and continuous time.

Year 2 (Spring term)

- Analysis of several variables, 7.5 credits (G1F) * The purpose of the course is to give the student skills to handle calculus in several variables.
- Linear algebra, 7.5 credits (G1F) * The purpose of the course is to deepen the knowledge in linear algebra, also in function spaces.
- Cryptography and coding theory, 7.5 credits (G1F) *The purpose of the course is to give the student an introduction to the theory of cryptography and coding and a demonstration of the most common cryptosystems and coding algorithms.
- Vector analysis, 7.5 credits (G1F) *The purpose of the course is to deepen the knowledge of calculus in two and three dimensions and prepare the student for studies in physics and engineering.

Year 3 (Autumn term)

- Ordinary differentialequations, 7.5 credits (G2F) *The purpose of the course is to study systems of ordinary differential equations. Applications in areas as mechanical engineering, electrical engineering, population dynamics and meteorology is addressed.
- Mathematical Physics, 7.5 credits (G2F) *The purpose of the course is to introduce the mathematical methods of mechanics.
- Elective courses in application field or mathematics, 15 credits. The purpose of

the optional courses is to give the student complementary knowledge and skills and a possibility for a specialization in the programme. These courses are selected in consultation with the programme co-ordinator.

Year 3 (Spring term)

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- Degree project, 15 credits (G2E) *The purpose of the Bachelor's essay is to give the student possibility to use all the knowledge and skills that have been achieved during the studies on an interesting problem.

*=main field course.

Community contacts

All students have opportunities to develop contacts with local trade and industrial representatives. These contacts are in the form of educational visits, projects, seminars etc. The main contact is through the concluding Bachelor's degree dissertation project which for many students will be a bridge for a career in trade and industry.

Studies abroad

Following consultation with the programme director, part of the programme can be pursued at university abroad.

Scope of the programme

On the basis of examples, assignments and the degree dissertation project, students' awareness of sustainable development, gender, equality and diversity and internationalization will be raised. Mathematics is in particularly suitable subject for internationalization. Mathematics is an international language.

Quality Development

A programme coordinator has the overall responsibility for the programme and the contact with the students.
The students are involved both in programme evaluations and course evaluations. The programme director regularly meets students to discuss courses and assist in the choice of optional courses. Compilations of course evaluations and programme evaluations will be archived by the department.

Degree Certificate

After completing programme studies, corresponding to the requirements expressed in the Higher Education Ordinance (Degree Ordinance) as well as the Linnaeus University local Degree Ordinance, the student may apply for a degree. Students who have completed the Applied Mathematics Programme may, obtain the following degree:

Filosofie kandidatexamen
Huvudområde: Matematik
Bachelor of Science in Mathematics.
Main field of study: Mathematics

The degree certificate is bilingual (Swedish/English). The Degree Certificate is accompanied by a Diploma Supplement (English).

Other Information

The programme can be completely studied in English.
However some optional courses can be given in Swedish only.