Linnæus University

Course syllabus

Board of Education Science
School of Computer Science, Physics and Mathematics

2MAÄ06 Matematik IV - inriktning mot arbete i gymnasieskolan, 15 högskolepoäng

Mathematics IV - for upper secondary school teachers, 15 credits

Main field of study
Mathematics

Subject Group
Mathematics

Level of classification
First Level

Progression
G2F

Date of Ratification
Approved by the Board of the School of Computer Science, Physics and Mathematics 2012-08-17

The course syllabus is valid from spring semester 2013

Prerequisites
For admission to the course the student has to be approved for at least 60 hp of the course Mathematics, 1-75 hp or equivalent.

Objectives

Common expected learning outcomes

After completing the course students will be able to:

- evaluate and respond to previous research and theories and methods in relation to self-examination and their own profession
- identify and formulate issues of relevance for further research and professional activities
- identify and analyze aspects of teaching profession in relation to the subject matter and subject matter didactics
- discuss, analyze and make didactic standpoints related to the activities that the education prepares for
- develop advanced mathematical skills in the areas covered in the course
- use and reflect on the course content of mathematics in relation to the subject and the subject didactics scientific traditions and theoretical concepts
- use the mathematical content covered in the course in an educationally conscious way in relation to the areas that the education prepares for.

Otherwise, the objectives for each module are listed below.

Module 1. Development of mathematics, 7.5 credits

After successfully completing the course, the student is anticipated to be able to:

- describe, in a historical perspective, the role that mathematics has played for different applications
- interpret and apply different civilization's mathematical methods for making calculations and solving problems
- interpret and communicate about the development of mathematics within a certain discipline.

Module 2. Discret mathematics, 7.5 credits
The student should be able to:

- define exactly central concepts of the course, derive relations between them and apply them to solve problems
- interpret, communicate and argue using mathematic notions
- solve combinatorial problems using different methods
- perform proofs by mathematical induction.
- perform logical deductions using truth tables and deduction schemes. Use quantifiers, and construct some simple expressions in predicate calculus
- solve linear recurrence relations
- describe the basic properties of functions and relations
- know elementary properties of graphs. Construct the chromatic polynomial for a graph.

Content

The course deepens the student's own mathematical knowledge while the mathematics education knowledge developes on the basis of the mathematics education portfolio that the students bring with them from the previous course.
Their own subject knowledge with respect to upper secondary school mathematics is related to learning and teaching of mathematics.

Module 1 Development of mathematics, 7.5 credits
Content:

- an overview of the development of mathematics from prehistoric times until the Middle Ages
- a more detailed exploration of how mathematics developed within the Babylonian, Egyptian, Greek, Chinese, Indian, Arabian, and the European civilizations from the middle-ages.
- a description of the interplay between mathematics and some applications, such as trade, land surveying, and natural sciences
- a deeper investigation of the mathematical development within a certain area.

Module 2. Discret mathematics, 7,5 hp

- Logic: Truth tables, deduction schemes, conjunctive normal form and some predicate calculus formalism.
- Set Theory: The principle of duality. De Morgan's laws. The principle of inclusion and exclusion.
- Relation and Functions: Theory of functions. Properties of relations. Equivalence relations. Partial orders. Representation of relations graphs and as matrices.
- Induction: The well-ordering principle. Mathematical induction. Recusive definitions and recursive procedures

- Generating Functions.
- Combinatorics.
- Difference Equations. Linear recurrence relations.
- Graphs: Euler circuits. Hamilton cycles. Planar graphs. Graph coloring and chromatic polynomials. Something about trees.

Type of Instruction

Teaching consists of lectures, group exercises and mandatory seminars. Part of the program may be online.

Examination

The course is assessed with the grades Fail (U), Pass (G) or Pass with Distinction (VG).
The course is examined partial through active participation in seminars, method meeting and presentations, partial through written and oral presentations of individual and group assignments, and partial through written examination/home exam.

Course Evaluation

After completing the course, is a course evaluation compiled and written feedback to the students. The statement recognized for the current institutional bodies and for the relevant Programme Board, and filed by the course coordinator department.

Required Reading and Additional Study Material

Module 1 Development of mathematics
Jan Thompson, Matematiken i historien, Studentlitteratur, latest edition, 300 (478) pages.

Jan Thompson, Matematiken i historien, Övningsbok, Studentlitteratur, 1996 or later. 124 (124) pages.

Modul 2 Discret mathematics
Kenneth H. Rosen.Discrete mathematics and its Applications, McGraw-Hill, latest edition. 500 (830) pages.

Compendium and articles, current year, Linnæus University, 50 pages