



## Course syllabus

Faculty Board of Science and Engineering

School of Computer Science, Physics and Mathematics

MN100L Matematik och naturvetenskap, grundskolans tidigare år, 30 högskolepoäng

MN100L Mathematics and Natural Sciences in compulsory school, years 1-6, 30 credits

### **Main field of study**

Mathematics

### **Subject Group**

Educational Sciences/Theoretical Subjects

### **Level of classification**

First Level

### **Progression**

G1N

### **Date of Ratification**

Approved 2009-06-23

Revised 2012-06-08 by School of Computer Science, Physics and Mathematics.

Literature list is revised.

The course syllabus is valid from autumn semester 2012

### **Prerequisites**

General entry requirements and Mathematics B, Science studies A, Civics A. (Field-specific entry requirements 15 with the exception of Science B).

## Objectives

The course is the first part of orientation Mathematics and Natural sciences in compulsory school, years 1-6. The orientation focus is to educate teachers, with teaching in years 1-6, in basic mathematics, natural sciences and technology.

Expected learning outcomes for the orientation:

After completing the course the student should be able to:

- exhibit relevant subject matter knowledge, which in combination with didactic ability can be translated into the profession
- support the young people's learning of mathematics, natural sciences and technology
- overview explain relevant research for the orientation, in the subject matter theory and in didactic, as a basis for professional development

- use information and critically evaluate information sources
- assess their own and students' conceptual understanding
- evaluate their own teaching in order to develop this
- be familiar with the history of mathematics, natural sciences and technology, cultural and societal context and their relevance to changes in society.

Expected learning outcomes for the course:

Module 1, Mathematics in compulsory school early years, 10 credits

After completing the course the student should:

- have the ability to independently analyze the mathematics content and methods
- be able to choose appropriate methods to perform calculations
- have the ability to put mathematics and mathematics teaching in a historical perspective and thereby illuminate mathematics as an important and fulfilling part of our culture
- be able to describe mathematics as a subject matter not only as a stereotypical thinking with rules, but that imagination and creativity are key ingredients to ensure the structure of the subject matter, development and problem solving methods
- have a good knowledge of the subject contained in mathematics teaching in school's earlier years and a comprehensive view of mathematics development in the whole compulsory school.

Module 2, Teaching and learning in mathematics in compulsory school early years, 5 credits

After completing the course the student should:

- demonstrate knowledge of current theories about how children develop early mathematical skills
- be familiar with theories of conceptual development in mathematics
- demonstrate the ability to work with students' understanding of various mathematical concepts
- be able to show how both their own and students' problem-solving skills developed
- be able to construct mathematical problems taken from students' immediate environment
- be able to treat mathematical moments included in the previous school year taking into account children's different prerequisites from a didactic point of view
- demonstrate skills to analyze and evaluate the mathematical content and teaching methods.

Module 3, Physics and Technology in compulsory school early years, 7.5 credits

After completing the course the student should:

- explain the basic physical and technical concepts and relationships
- demonstrate basic skills in laboratory and experimental teaching
- plan the teaching in physics and technology from relevant didactic research in order to create good learning environment
- explain how the development of a technical system can affect society when taking into account sustainable development
- give an overview of what the technical progress has throughout history.

Module 4, Biology and Chemistry in compulsory school early years, 7.5 credits

After completing the course the student should:

- account for basic biological and chemical concepts and relationships
- demonstrate basic skills in chemical and biological methods and the ability to translate these to the school conditions

- plan the school's biology and chemistry education from relevant didactic research in order to create good learning environment
- plan and conduct field trips in different habitats and for different age groups
- explain how to safely handle chemicals in school activities, and carry out risk assessments
- identify a number of commonly used plants and animals in Swedish.

## Content

### *Module 1, Mathematics in compulsory school early years, 10 credits*

- Arithmetic: the development of number system, place value system, the four operations of arithmetic, basic fractions counting and proportion's theory, number sense.
- Geometry: basic geometric concepts, space and time perception.
- Algebra: patterns, prealgebra, the transition from counting with number to counting with symbols, the algebraic cycle.
- Statistics: basic statistical concepts, data collection, processing and interpretation of data.

### *Module 2, Teaching and learning in mathematics in compulsory school early years, 5 credits*

- Students' meeting with and attitudes towards mathematics.
- The role of language, social and cultural aspects of learning in mathematics.
- Pedagogical and methodological tools in mathematics education: work and working methods, calculators and computers.
- Policy documents, diagnosis, evaluation and assessment of knowledge, analysis of textbooks.

### *Module 3, Physics and Technology in compulsory school early years, 7.5 credits*

- Basic notions and concepts in physics and technology.
- Laboratory activities in the didactic perspective.
- Advancement within a technology system that includes design and practical problem-solving.
- Physics and technology development and driving forces behind this.
- Planning a school adapted physic/technique theme.
- Policy documents, evaluation and assessment of knowledge.

### *Module 4, Biology and Chemistry in compulsory school early years, 7.5 credits*

- Plant and animal kingdom systematic classification, and the reasons for this.
- Ecology and ecosystem studies.
- Photosynthesis and cellular respiration.
- Species.
- Chemical concepts and everyday chemistry.
- Harmful effects of chemicals and risk assessment in school activities.
- Excursion-and laboratory activities in biology and chemistry from didactic perspective.
- Policy documents, evaluation and assessment of knowledge.

### *Progression routes*

- Language as a tool – All the courses in the orientation have a focus on language as tool. The student is trained to use, to communicate and to understand the mathematical and the natural sciences concepts and the discourses in subject matter-area.
- IT and learning – The students develop their IT-skills throughout the whole course. Elements of lectures in didactic, discussions and studies on how IT is used in the school orientation subject matter occur. Facts search and laboratory work tips on the Internet. Simple programming blocks.

- Scientific progression - Analysis of texts and articles in mathematical and NV-didactic activities. Projects that are reported in scientific reports.
- Teacher profession - Seminars in didactic issues. Didactic discussion and analysis in relation to theory, laboratory work, field trips and practical work.

### Type of Instruction

Teaching consists of lectures, seminars, group exercises, field trips and laboratory. Participation in exercises, group exercises, field trips and seminars are obligatory, as well as briefings and presentations related to these.

When the course is followed at a distance the Internet is required.

### Examination

The course is assessed with the grades Fail (U), Pass (G) or Pass with Distinction (VG).

Examination is usually by written exam, oral presentations and written reports. Active participation in group work/seminars and other practical elements are involved as a part of the assessment. Assessment criteria for passing grade on the modules shown in Learning Outcomes (see above). The final grade is a combination of the grade of modules. A re-examination is offered in the first six weeks forward. The numbers of examinations dates are limited to five.

### Course Evaluation

A course evaluation will be carried out at the end of the course in accordance with the guidelines of the University. The result of the course evaluation will be filed at the department.

### Required Reading and Additional Study Material

#### Required Reading

Module 1, Mathematics in compulsory school early years, 10 credits

Bergsten, C., Häggström, J. & Lindberg, L. 1997. Algebra för alla. Nämnaren Tema, NCM. ISBN 91-88450-08-2

Löwing Madeleine, *Grundläggande geometri-Matematikdidaktik för lärare*. Studentlitteratur 2011, ISBN 978-91-44-07283-8.

Löwing, M. 2008 (eller senare). Grundläggande aritmetik-Matematikdidaktik för lärare, Studentlitteratur, Lund. ISBN 978-91-44-00874-5.

Sollervall, H. 2007. Tal och de fyra räknesätten. Studentlitteratur, Lund. ISBN 978-91-44-04527-6

Hatami Reza, 2012, Linnéuniversitetet- DFM, Aritmetik & (pre)algebra för Lärarutbildning FK-årk 6. e-book (students get free access to the book)

Module 2, Teaching and learning in mathematics in compulsory school early years, 5 credits

Johnsen Høines, M. 2000. Matematik som språk. Verksamhetsteoretiska perspektiv. Malmö, Liber AB. ISBN 91-47-04670-8

Löwing, M. & Kilborn, W. 2002. Baskunskaper i matematik. Studentlitteratur, Lund. ISBN 91-44-02217-4

Malmer, G. 2002. Bra matematik för alla. Studentlitteratur, Lund. ISBN 91-44-01287-X

Subcours 1 and 2:

Current curricula in mathematics from the National Agency for Education

Relevant documents from the National Agency for Education on the objectives, analysis of pupils' skills and diagnoses in Mathematics

Scientific articles

Training Materials

Module 3, Physics and Technology in compulsory school early years, 7.5 credits

Sundin, B. 1993. Den kupade handen. Carlssons förlag. ISBN 91-7-798443-9

Module 4, Biology and Chemistry in compulsory school early years, 7.5 credits

Alriksson, C-G. 2008. Vardagskemi. Kompendium, Naturvetenskapliga institutionen.

Betzholtz, P.-E. 2008. Ut i naturen. Kompendium, Naturvetenskapliga Institutionen.

Pleijel, H. 2003. Ekologiboken. Institutionen för växt- och miljövetenskaper. ISBN 91-88-37620-6

Strömdahl, H. (red.) 2002. Kommunera naturvetenskap i skolan. Studentlitteratur, Lund. ISBN 91-44-040777-6

Reference literature

### **Reference Literature**

Patel, R., & Davidson, B. 2003. Forskningsmetodikens grunder. Studentlitteratur, Lund.

Utbildningsdepartementet. 1998. Läroplan för förskolan, Lpfö 98. Skolverket och Fritzes.

Utbildningsdepartementet. 1998. Läroplan för det obligatoriska skolväsendet, förskoleklassen och fritidshemmet, Lpo94. Skolverket och Fritzes.

Utbildningsdepartementet. 2000. Kursplaner för grundskolan. Skolverket och Fritzes.

Dahlbom, M. 1997. Fysik för lärare i grundskolan, åk 1-7. Kompendium.