Linnæus University

Jnr: UGA 2013/2110-3.1.2

Course syllabus

Faculty of Technology
Department of 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 2012-08-17
Revised 2013-10-08 by Faculty of Technology. Literature list, content and objectives are revised.
The course syllabus is valid from spring semester 2014

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 completing the course students will 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 Analysis in several variables, 7.5 credits
After completing the course students will be able to:

- understand the basic properties of open, closed and compact sets in R^n
- understand the limit concept and be able to calculate limits of functions of several variables, even using the definition of limit
- understand and be able to deduce the properties of continuous functions on compact sets
- optimize partial differentiable real-valued functions
- understand the concept of differentiability and be able to investigate whether a function is differentiable
- connect the differentiability to linearization and existence of tangent planes
- understand and use the chain rule even for partial derivatives of higher order
- apply the chain rule to simplify and solve simple partial differential equations
- understand the gradient and the geometric meaning of directional derivate, as well as apply them, including the tangent planes calculations
- calculate integrals by repeated integration and substitution of variables
- do area and volume calculations using the double integrals
- calculate areas and volumes using double integrals
- describe the definitions, and deduce the relationship between central concepts of the course as well as use these in problems solving
- interpret, communicate and argue with mathematics representational forms.

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

- 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 Analysis in several variables, 7.5 credits

- open, closed and compact sets in n-dimensional space
- functions of several variables; limits; continuity
- continuous functions on compact sets
- partial derivatives
- optimization of functions of several variables
- differentiability
- chain rule
- gradient and directional derivate
- implicit and inverse function theorem
- double integrals

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.

Delkurs 2 Analysis in several variables
Robert A Adams. Calculus - A Complete Course, Pearson Education Limited. Latest edition. 250 (1020) pages.

Didactic literature

Hansen Hans Christian, Skott Jeppe, Jess Kristine, Schou John, Matematik för lärare Ypsilon volume 1 and volume 2, Gleerups förlag, latest edition.