SF1661 Perspectives on Mathematics 6.0 credits

Perspektiv på matematik

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus for SF1661 valid from Autumn 2011

Grading scale

A, B, C, D, E, FX, F

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

Basic and specific requirements for engineering program.
Mandatory for first year, can not be read by other students

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

After completing this course with a passing grade the student should have deepened and consolidated his/hers knowledge in and understanding of certain areas central to the mathematics of upper secondary school, and also be aware of some didactical difficulties with this content. The student should also have acquired complementary knowledge of importance for further studies and professional activities. Furthermore the student should have developed his/hers ability to carry out, explain and communicate mathematical reasoning. In particular, the student should be able to

- Account for the concepts of natural numbers, integers and rational numbers, show knowledge on how real and complex numbers can be represented, and also show knowledge on how the arithmetical operations defined on natural numbers can be generalized to other number systems.

- Account for the concept of prime numbers and some of their elementary properties.

- Explain how the power laws for positive integer powers can be generalized to non-positive integer powers and rational powers and also explain the connection between the power laws and the laws of the logarithm.

- Simplify numerical and algebraic expressions

- Account for the Euclidean distance on the line, in the plane and in 3-space and also for the equations of circles and spheres, and show knowledge about the equations for conic sections in the plane.

- Account for how complex numbers can be expressed in polar form and using the complex exponential function, and carry out computations with complex numbers in rectangular and polar form

- Use the unit circle and the complex exponential function to deduce trigonometric identities,

- Interpret and use the sigma summation symbol, and deduce, explain and apply the formulas for geometrical and arithmetical sums.

- Account for and apply Pascal's triangle and the binomial theorem.

- Show knowledge of the general concept of a function and the concepts domain of definition, range, composition of functions and invers, and apply them to the elementary functions.

- Solve simple polynomial and rational equations and inequalities using the Factor theorem, polynomial long-division and sign tables.

- Solve certain equations involving trigonometric expressions, fractional powers, logarithms and absolute values.

- Show understanding of the concepts derivative and definite integral and their applications.

- Apply the mathematical content of the course in problem solving.

- Communicate computations and mathematical reasoning.

- Account for some common didactical difficulties with the mathematical content in upper secondary school.

Furthermore the student should after completing the course have developed his/hers techniques of study in a way suitable for further studies in mathematics and neighboring subjects, and should also have seen examples of the usage of mathematical software.

Course contents

- The nature of mathematical concepts. Mathematical reasoning and communication.
- The concept of numbers. Prime numbers. Arithmetics using natural numbers, integers, rational, real and complex numbers. Powers and logarithms.
- Elementary analytic geometry in the plane and in 3-space.
- Sequences and sums. The binomial theorem.
- Polynomials and the Factor theorem.
- The concept of a function and the elementary functions.
- The concepts of the derivative and the definite integral and their use in applications.
- Techniques for studying mathematics and teaching and learning of mathematics.

Course literature

Gottlieb, Christian. Aritmetik. 2:nd edition. Compendium. Stockholms universitet, 2003.
Gottlieb, Christian. Funktionslära. Compendium. Stockholms universitet, 2002.
Courant, R. & Robbins, H. What is mathematics? 2:nd edition, revised by Stewart, I. Oxford University press, 1996. ISBN13: 9780195105193. ISBN10: 0195105192 .
Complementary material will be distributed during the course..

Examination

- TEN1 - Examination, 6.0 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

Other requirements for final grade

The examination consists of continuous examination such as group work, homework assignments and oral presentations as well as a final written exam. For a passing grade it is required to participate actively during lectures and problem sessions on techniques for studying mathematics and on the teaching and learning of mathematics.

Grade scale: A, B, C, D, E, FX, F

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.