SF1650 Extended Complex Analysis and Differential Equations 6.0 credits

Utvidgad komplex analys och differentialekvationer

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

Establishment

Course syllabus for SF1650 valid from Autumn 2007

Grading scale

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

Education cycle

First cycle

Main field of study

Mathematics, Technology

Specific prerequisites

SF1602 + SF1603 Calculus II, part 1+2, and SF1604 Linear Algebra. Also SF1628 Complex Analysis is assumed to be studied in parallel.

Language of instruction

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

Intended learning outcomes

After this course the students should be able to

give an account of existence theorems for ordinary differential equations

give an account of the theory for linear equations of third and higher order

give an account of the elements of the theory for power series solutions

give an account of qualitative properties of solutions to differential equations of order 2

give an account of Liapunov functions and their use

give an account of the fast Fourier transform

give an account of some properties of continuous functions

give an account of some properties of the Radon transform

give an account of some properties of wavelets

give an account of some properties of the heat equation and the Laplace equation

give an account of some properties of the Lebesgue integral

- Solve Dirichlet's problem in a disk and in a half plane
- Give an account of the maximum principle for harmonic functions and Harnack's ineaulity
- Describe the basic concepts and theorems of the theory of complex dynamics in one variable
- Formulate and prove convergence properties of power series, notably the theorems about termwise differentiation and integration
- Formulate and prove certain theorems from the basic theory of univalent functions
- Use Schwarz-Christofels och Joukowskis transformations to solve applied problems
- Give an account of quaternions, their applications and links to complex numbers

Course contents

Existence theorems for ordinary differential equations, linear equations of third and higher order, the elements of the theory for power series solutions, qualitative properties of solutions to differential equations of order 2, Liapunov functions.

The fast Fourier transform, some properties of continuous functions, the Radon transform, wavelets, the heat equation and the Laplace equation, a few properties of Lebesgue integrals.

- Analytic, harmonic och subharmonic functions, Dirichlet's problem, dynamical systems, fractals, Julia and Mandelbrot sets, uniform convergence, univalent functions, conformal mapping, quaternions

Course literature

Simmons, Differential Equations with Applications and Historical Notes.

Stein-Shakarchi, Fourier Analysis. An Introduction.

Wunsch: Complex Variables with Applications, 3:rd ed. and additional material

Examination

- TEN3 - Examination, 2.0 credits, grading scale: A, B, C, D, E, FX, F
- TEN2 - Examination, 2.0 credits, grading scale: A, B, C, D, E, FX, F
- TEN1 - Examination, 2.0 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.

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

Other requirements for final grade

Written or oral examination and/or home assignments.

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.