Linnæus University

Jnr: 2020/1874-3.1.2.2

Course syllabus

Faculty of Technology
Department of Mathematics

2MA408 Fouriermetoder och komplex analys, 7,5 högskolepoäng
Fourier methods and complex analysis, 7.5 credits

Main field of study
Mathematics

Subject Group
Mathematics

Level of classification
First Level

Progression
G2F

Date of Ratification
Approved by Faculty of Technology 2020-05-18
The course syllabus is valid from spring semester 2021

Prerequisites
1MA465 Multivariable calculus and vector calculus or 1MA452 Calculus of several variables or corresponding course

Objectives

After the course the student must be able to:

1. Knowledge and understanding

- Explain analytic concepts like uniform and pointwise convergence, analytic function, Cauchy's integral formula, residue calculus, Fourier series, Fourier transform, Laplace transform, z transform, convolution, and
- formulate and prove results that are important in complex analysis, like Cauchy's integral formula, the identity theorem, the residue theorem, Parseval's formula, inversion formulas.

2. Ability and capacity

- Perform computations in complex analysis, function series and transform methods,
- apply residue calculus and transform methods to mathematical problems,
- show capacity to present in written form and explain computations and mathematical arguments in a correct, structured and logically coherent way.

3. Assessment and approach

- Show capacity to assess reasonability of results from mathematical computations

- Show capacity to assess reasonability of results from mathematical computations and problem solving.

Content

The purpose of the course is to give an introduction to function theory, complex analysis and transform methods with applications in mathematics, physics and engineering. In particular the course is preparatory for further studies in differential equations, signal processing, automatic control and stochastic processes.

- Function theory: sequences of functions, function series, pointwise and uniform convergence, function norms.
- Fourier series: exponential and trigonometric Fourier series, convergence, Parseval's formula.
- Analytic functions: definition of analytic function, the Cauchy-Riemann equations. Elementary analytic functions. Cauchy's integral theorem and integral formula. Expansion in power series. The identity theorem. The residue theorem. Computation of real integrals using residue calculus.
- Elements of the Fourier transform, the Laplace transform and the z transform.

Type of Instruction

Lectures and teacher led exercise classes.

Examination

The course is assessed with the grades A, B, C, D, E, Fx or F.
The grade A is the highest grade, and the remaining grades follow in decreasing order where E is the lowest grade to pass. The grade F means that the student's performance is considered insufficient to pass.

Examination consists of a written and possibly an oral exam.

Repeat examination is offered in accordance with Local regulations for courses and examination at the first and second-cycle level at Linnaeus University.

If the university has decided that a student is entitled to special pedagogical support due to a disability, the examiner has the right to give a customised exam or to have the student conduct the exam in an alternative way.

Course Evaluation

During the implementation of the course or in close conjunction with the course, a course evaluation is to be carried out. Results and analysis of the course evaluation are to be promptly presented as feedback to the students who have completed the course. Students who participate during the next course instance receive feedback at the start of the course. The course evaluation is to be carried out anonymously.

Required Reading and Additional Study Material

Mandatory literature:

- Saff, E. B., Snider, A. D., Fundamentals of Complex Analysis with Applications to Engineering, Science, and Mathematics, Pearson Education. Latest edition. 520 pages
- Material from the department.

Complementary literature:

- Wikström, F., Funktionsteori, Studentlitteratur. 380 pages