GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2025-2026

Complex Analysis (C004219)

Course size *(nominal values; actual values may depend on programme)*

Credits 4.0 **Study time 120 h**

Course offerings and teaching methods in academic year 2025-2026

A (semester 1)	Dutch	Gent	lecture
			seminar

Lecturers in academic year 2025-2026

Vandersickel, Nele	WE05	lecturer-in-charge

Offered in the following programmes in 2025-2026	**crdts**	**offering**
Bachelor of Science in Physics and Astronomy	4	A

Teaching languages

Dutch

Keywords

see content

Position of the course

The aim of this course is to let the student work with complex numbers and all their applications

Contents

1 Complex numbers
- The Algebra of Complex Numbers
- Complex Conjugates
- Vectors
- Polar coordinates
- The Complex Exponential
- Powers and Roots
- Planar Sets

2 Analytic Functions
- Functions of a Complex Variable
- Limits and continuity
- Analyticity
- The Cauchy-Riemann Equations
- Harmonic Functions

3 Elementary Functions
- Polynomials
- Rational functions
- The Exponential function and relations to trigonometric and hyperbolic functions
- The Logarithmic Function
- Complex Powers
- Inverse Trigonometric Functions

4 Complex Integration
- Contours
- Contour Integrals
- Independence of Path
- Cauchy's Integral Theorem

- Cauchy's Integral Formula and Its Consequences .
- Bounds for Analytic Functions

5 Series Representations for Analytic Functions

- Sequences and Series
- Taylor Series
- Power Series
- Laurent Series
- Zeros
- Singularities
- The Point at Infinity
- Analytic Continuation

6 Residue Theory

- The Residue Theorem
- Trigonometric Integrals over [0, 2π]
- Improper Integrals of Certain Functions over (−∞, ∞)
- Improper Integrals Involving Trigonometric Functions
- Indented Contours
- Integrals Involving Multiple-Valued Functions
- The Argument Principle and Rouché's Theorem

7 The Transforms of Applied Mathematics

- Finite Fourier Transform (Fourier Series) of periodic functions
- The Fourier Transform
- The Laplace Transform

Initial competences

Final competences

1 The aim of this course is to let the student work with complex numbers and all their applications.
2 To be able to work out contour integrals.
3 To be able to work out exercises on Fourier and Laplace transforms

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Seminar, Lecture, Independent work

Extra information on the teaching methods

The students will have to solve problems during the classes

Study material

Type: Syllabus

Name: Complex analysis
Indicative price: Free or paid by faculty
Optional: no
Language : English
Number of Pages : 192
Available on Ufora : Yes
Online Available : No
Available in the Library : No
Available through Student Association : Yes
Additional information: You will get the course via Ufora and you can chose if you want to print the course

References

Fundamentals of Complex Analysis: with Applications to Engineering and Science
by Edward B. Saff

Course content-related study coaching

Guided exercises

Assessment moments

end-of-term and continuous assessment

Examination methods in case of periodic assessment during the first examination period

Written assessment with open-ended questions

Examination methods in case of periodic assessment during the second examination period

Written assessment with open-ended questions

Examination methods in case of permanent assessment

Written assessment

Possibilities of retake in case of permanent assessment

not applicable

Extra information on the examination methods

There will be 2 exercise sessions that are compulsory. During these session students will solve exercises, each for 1 of the 20 exam points. Feedback will be provided.
Exam will consist exclusively of exercises that will gauge the student's knowledge of complex analysis for 18 of the 20 points

Calculation of the examination mark

The final score is calculated by adding the two points earned throughout the year (2 mandatory practice sessions, each worth 1 point) to the final exam score (worth 18 points). This results in a total of 20 points.

Facilities for Working Students

Working students are allowed to process exercises and teaching material themselves and only participate in the final exam