

## Analysis I (C003574)

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

**Credits** 6.0

**Study time** 180 h

**Contact hrs**

67.5h

**Course offerings and teaching methods in academic year 2022-2023**

A (semester 1)

Dutch

Gent

online seminar: coached  
exercises

0.0h

lecture

45.0h

seminar: coached exercises

22.5h

online lecture

0.0h

**Lecturers in academic year 2022-2023**

Vindas Diaz, Jasson

WE16

lecturer-in-charge

**Offered in the following programmes in 2022-2023**

[Bachelor of Arts in Philosophy](#)

**crdts**

6

**offering**

A

[Bachelor of Science in Mathematics](#)

6

A

**Teaching languages**

Dutch

**Keywords**

Functions of a real variable, differential calculus, integral calculus

**Position of the course**

This course contributes to the goals of the bachelor study program by offering a well-founded and at the same time widely applicable introduction to functions of one real variable. It consists entirely of 'broad basic knowledge', and it supplies knowledge and skills that are useful and often indispensable in many other domains. Students get gradually familiarized with the typical methods and the reasoning for mathematical analysis. Exhaustive completeness has not been aimed at. Every single subject has been selected on the basis of its usefulness, and all treated results come with proofs. The content of the proofs is mathematical rigorous, but often rephrase into informal words. The theory is intrinsically linked to exercises aiming also at self-activity.

**Contents**

Rational, real and complex number fields. Limits of functions. Continuity, Bolzano, Weierstrass and Heine theorems. Differentiability. Mean value theorem. Monotonicity. l'Hospital's rule. C1 functions. Higher order derivatives. Lower integral, upper integral, (Riemann) integral. Darboux criterion. Fundamental Theorems of Calculus I and II. Integration by parts, change of variables. Taylor formula with an integral as remainder. Primitives. Exponential function, power functions, hyperbolic functions; logarithmic and inverse hyperbolic functions. Sine, cosine, tangent and their inverses. Practical integration techniques. Real sequences, Bolzano-Weierstrass theorem. Complex series, Cauchy, d'Alembert and Raabe convergence rules. Cauchy's integral test. Leibniz' rule for alternating series. Improper integrals. Uniform convergence of sequences and series, Weierstrass M-test. Complex power series. Convergence disc, termwise differentiation and integration, Abel's limit theorem. Taylor series. Binomial series.

**Initial competences**

Final objectives of secondary education.

**Final competences**

The student should be able to assess an elementary (theoretical or practical) problem of real analysis in one variable to reason about its solution, and to find a solution via the learned methods.

#### **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**

Online lecture, Lecture, Online seminar: coached exercises, Seminar: coached exercises

#### **Extra information on the teaching methods**

Due to the COVID19 changes in the teaching methods could occur in case this becomes necessary.

Theory: oral presentation supplemented with didactical applets.

#### **Learning materials and price**

Syllabus "Analysis I" (approximate price €10.00), annually revised.

#### **References**

Apostol, T. M. Calculus I. One-variable calculus, with an introduction to linear algebra. 2nd ed. New York (N.Y.): Blaisdell, 1967.

Apostol, Tom M. Mathematical Analysis. 2nd ed. Reading (Mass.): Addison-Wesley, 1974.

Rudin, W., Principles of mathematical analysis. McGraw-Hill, 1976.

Spivak, M., Calculus. London: Benjamin, 1973.

#### **Course content-related study coaching**

Besides regular support by the appointed lecturers, consultation hours and permanent availability before and after classes.

#### **Assessment moments**

end-of-term assessment

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

Written examination with open questions

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

Written examination with open questions

#### **Examination methods in case of permanent assessment**

#### **Possibilities of retake in case of permanent assessment**

not applicable

#### **Extra information on the examination methods**

Written evaluation in two parts, theory and exercises. In the theory part, knowledge and skills acquired will be tested, as well as the ability to interconnect different subjects. In the exercise part, the acquired skills will have to be applied.

#### **Calculation of the examination mark**

Periodic evaluation 100%.