

## Analysis: Functions of Several Variables (I002910)

**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 2024-2025**

A (semester 2)	Dutch	Gent	independent work	0.0h
			lecture	20.0h
			seminar	20.0h

**Lecturers in academic year 2024-2025**

Schelfaut, An	LA26	staff member
Van de Walle, Elien	LA26	staff member
Baetens, Jan	LA26	lecturer-in-charge
Waegeman, Willem	LA26	co-lecturer

**Offered in the following programmes in 2024-2025**

	crdts	offering
<a href="#">Bachelor of Science in Bioscience Engineering</a>	4	A

**Teaching languages**

Dutch

**Keywords**

Vector-valued functions, multivariable calculus, extrema of functions of several variables, Lagrange multipliers, multiple integrals, coordinate transformations, cylindrical and spherical coordinates, vector fields, line, contour and surface integrals  
Python, SymPy

**Position of the course**

This course provides the students with the tools and techniques that are needed to approach and solve engineering problems and to understand, analyse and describe biological, natural and production processes. Such a solid mathematical background is needed in engineering disciplines, and is surely pervaded by differential and integral calculus. The focus of this course will be on functions of several variables. Problem solving and a sound theoretical underpinning of the presented techniques, concepts and methods are key to this course. Given the growing complexity of engineering problems and the omnipresence of computers, the students will also be introduced to numerical and symbolical calculations in Python and SymPy.

**Contents**

- 1 Functions of several variables
- 2 Optimisation
- 3 Vector-valued functions
- 4 Multiple integration
- 5 Vector calculus

**Initial competences**

Analysis I: functions of one variable; Linear algebra

**Final competences**

- 1 Understand the mathematical, geometric and physical meaning of functions of several variables.

2 Understand the mathematical, geometric and physical meaning of vector-valued functions, coordinate transformations, cylindrical and spherical coordinates, multiple integrals, vector fields and line, contour and surface integrals.

3 Use vector-valued functions, functions of one variable, coordinate transformations, cylindrical and spherical coordinates, multiple integrals, vector fields and line, contour and surface integrals.

4 Proofs statements regarding functions of several variables.

5 Work correctly and with mathematical precision with functions of several variables.

#### **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**

During the lectures important concepts and properties are introduced, which form the starting point for solving problems during the seminars.

#### **Study material**

Type: Syllabus

Name: Analysis of functions of one and several variables

Indicative price: € 30

Optional: no

Language : Dutch

Oldest Usable Edition : 2023-2024

Available on Ufora : Yes

Online Available : No

Available in the Library : Yes

Available through Student Association : Yes

Additional information: This syllabus contains the course material for both Analysis: functions of one variable, and Analysis: functions of multiple variables.

#### **References**

Hartman, G., Siemers, T., Heinold, B., Chalishajar, D., Bowen, J., APEX Calculus; R. Adams and C. Essex, Calculus, a complete course

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

The lecturer answers questions concerning the theory upon appointment and before and after the lectures, the teaching assistants are available for questions related to the exercises and practical sessions, interactive support via Ufora.

#### **Assessment moments**

end-of-term assessment

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

Written assessment with multiple-choice questions, Written assessment with open-ended questions

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

Written assessment with multiple-choice questions, Written assessment with open-ended questions

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

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

not applicable

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

The exam consists of exercises and questions of a more theoretical nature.

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

Students who eschew period aligned and/or non-period aligned evaluations for this course unit may be failed by the examiner.

