GHENT UNIVERSITY

Course Specifications

From the academic year 2024-2025 up to and including the academic year

Differential Geometry (C004420)

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

Credits 6.0 **Study time 165 h**

Course offerings and teaching methods in academic year 2025-2026

A (semester 2)	Dutch	Gent	seminar
			lecture

Lecturers in academic year 2025-2026

Van Bockstal, Karel	WE16	lecturer-in-charge

Offered in the following programmes in 2025-2026	**crdts**	**offering**
Bachelor of Science in Mathematics	6	A

Teaching languages

Dutch

Keywords

Classical differential geometry, curves and surfaces, differentiable manifolds, Riemannian geometry.

Position of the course

In the first two chapters we treat the classical differential geometry of curves and surfaces in R^3. In the third chapter we give an introduction to modern differential geometry, and to the theory of differentiable manifolds and Riemannian manifolds.

Contents

1. Curves
Curves in 3-dimensional Euclidean space. Arclength, curvature and torsion, the canonical representation of a curve. The fundamental theorem.
2. Surfaces
Surfaces in 3-dimensional Euclidean space. Tangent plane. The first fundamental form. Isometries. Normal and geodesic curvature. Weingarten map, Gaussian curvature, mean curvature, principal curvatures. Christoffel symbols, geodesic lines, Riemann curvature tensor. Theorema Egregium.
3. Differentiable manifolds
Generalities about differential manifolds. Examples: matrix groups and surfaces in R^3. Tangent spaces of a manifold. Riemannian manifolds.

Initial competences

Final competences of the courses Analysis I, Analysis II and Linear Algebra and Geometry I. Some preknowledge of classical mechanics is advisable.

Final competences

1 To have insight in all structures and concepts that were introduced in this course.
2 To recognize these structures in other branches of mathematics and mathematical physics.

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

Extra information on the teaching methods

Theory: ex kathedra. Guided exercise classes.

Study material

Type: Syllabus

Name: Differentiaalmeetkunde
Indicative price: Free or paid by faculty
Optional: no
Language : Dutch
Number of Pages : 148
Oldest Usable Edition : 2022-2023
Available on Ufora : Yes
Online Available : Yes
Available in the Library : No
Available through Student Association : No
Additional information: Course notes written by Tom Mestdag. A pdf version is made available on Ufora which the students can download and print.

References

M.P. Do Carmo, Differential Geometry of Curves and Surfaces, Prentice Hall (1976)
T.J. Willmore: Riemannian Geometry, Clarendon Press (Oxford) (1993).
S. Sternberg, Curvature in Mathematics and Physics, Dover Publications (2012)

Course content-related study coaching

Consultations with the teachers are always possible.

Assessment moments

end-of-term 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

Possibilities of retake in case of permanent assessment

not applicable

Extra information on the examination methods

Theory: written exam. Exercises: open book exam.

Calculation of the examination mark

100% periodic evaluation. 10 points for theory, 10 points for exercises.