



# Exchange programme Vrije Universiteit

Vrije Universiteit Amsterdam - Exchange programme Vrije Universiteit - 2022-2023

## Exchange

Vrije Universiteit Amsterdam offers many English-taught courses in a variety of subjects, ranging from arts & culture and social sciences, neurosciences and computer science, to economics and business administration.

The International Office is responsible for course approval and course registration for exchange students. For details about course registration, requirements, credits, semesters and so on, please [visit the exchange programmes webpages](#).

# Differential Topology

Course Code	XB_0068
Credits	6.00
Period	P4+5
Course Level	300
Language Of Tuition	English
Faculty	Faculty of Science
Course Coordinator	dr. S.D. Barthel
Examiner	dr. S.D. Barthel
Teaching Staff	dr. S.D. Barthel
Teaching method(s)	Partial Exam, Lecture, Seminar

## Course Objective

At the end of this course:

- the student understands the introduced concepts such as coverings, degree of a function, intersection number, and is able to use these to prove some fundamental results;
- the student understands the meaning of the theorems and knows how to derive them;
- the student can relate different properties to each other, for example relating the zeros of transversal vector fields to the genus of the surface.

## Course Content

Differential topology studies differentiable manifolds and differentiable functions from a topological viewpoint. In contrast to differential geometry properties arising from metrics are not studied, and in contrast to the general topology course, the spaces are restricted to nicely behaving manifolds. Studied properties of the manifolds are rather global than local. The classification of coverings can be seen as an alternative formulation of the fundamental theorem of Galois theory, allowing to derive an algebraic theorem from a topological perspective.

The following topics will be covered during the course:

- classification of coverings;
- Sard's theorem;
- Brouwer's fixed point theorem;
- transversality;
- intersection theory and degree theory;
- Euler characteristic;
- index of vector fields;
- Hopf theorem

This is covering theory plus the content of Chapter 1.5, 1.7, 2, 3 of the accompanying book.

## Additional Information Teaching Methods

Lectures and tutorials (2+2 hours per week)

## Method of Assessment

For this course there is a midterm examination (50%) and a final exam (50%). There will also be a resit

examination.

## Literature

Guillumin and Pollack: Differential Topology

## Additional Information Target Audience

Bachelor Mathematics, year 3

## Recommended background knowledge

Topology