

INFORMATION ON THE SEMINAR ON DIFFERENTIAL TOPOLOGY (MASTER-STUDIES) – WS 25/26

LÜCK, W.

1. PLACE AND TIME

- time: Tuesdays 14:15 -16:00,
- place: ??
- begin: October 14th

2. CONTENTS

The topic is differential topology. We will follow the book by Bröcker and Jänich [2] with the title *Introduction to differential topology*. The talks will be in English. (There is also a German edition [1]).

3. TALKS

We will have the following talks:

No.	title	Date	chapters
1.	Local and tangential properties and Sard's Theorem	14.10.2025	5 and 6
2.	Embeddings	21.10.2025	7
3.	Dynamical systems	28.10.2025	8
4.	Isotopies of embeddings	04.11.2025	9
5.	The connected sum	11.11.2025	10
6.	Differential equations of order 2 and spays	18.11.2025	11
7.	Exponential maps and tubular neighborhoods	25.11.2025	12
8.	Manifolds with boundary	02.12.2026	13
9.	Transversality and applications	09.12.2026	14
10.	The Pontrjagin Thom construction	16.12.2026	-
11.	Rational oriented Bordism	13.01.2026	-
12.	Chern classes and Pontryagin classes	20.01.2026	-
13.	An exotic sphere	27.01.2026	-

We suggest to have no talk on December 23rd because the number of participants will be very low at that day.

In the third talk the statement of Sard's Theorem shall be discussed but no proof shall be presented. The last four talks will also cover some material not contained in [2], we recommend the contents of *Algebraic Topology I and II*, as held in Winter 2024/25 and Summer 2025 as preliminaries for these talks.

The last talk will be a kind of survey.

4. PREREQUISITES

As preliminaries, we recommend solid foundations on the definitions of smooth manifolds, vector bundles and the tangent bundle, as can be found in the first few chapters of [2], as well as knowledge of the material presented in the lecture courses *Introduction to Geometry and Topology* from the summer term 23. It is helpful to

have some basic knowledge about the lecture courses *Topology I* and *Topology II* from the winter term 23/ 24 and the summer term 24, but not strictly necessary for the first nine talks.

So one needs to know the basics about point set topology, smooth manifolds, and vector bundles but no requirements about CW-complexes and (co)homology are made.

5. SUPERVISION

The student responsible for a talk will meet Christian Kremer or Wolfgang Lück a week before the talk to discuss mathematical problems and a little bit about the organization of the talk.

6. PRELIMINARY DISCUSSION IN THE SUMMER TERM 2025

On July 15th from 11.00 - 12:00 there will be a joint preliminary discussion about this seminar and the seminar by Stefan Schwede in the Lipschitz Saal.

REFERENCES

- [1] T. Bröcker and K. Jänich. *Einführung in die Differentialtopologie*. Springer-Verlag, Berlin, 1973. Heidelberger Taschenbücher, Band 143.
- [2] T. Bröcker and K. Jänich. *Introduction to differential topology*. Cambridge University Press, Cambridge, 1982. Translated from the German by C. B. Thomas and M. J. Thomas.

MATHEMATICAL INSTITUTE OF THE UNIVERSITY OF BONN, ENDENICHER ALLEE 60, 53115 BONN, GERMANY

Email address: `wolfgang.lueck@him.uni-bonn.de`

URL: `http://www.him.uni-bonn.de/lueck`