

AB Geometrie und Topologie

Prof. Bernhard Leeb, Ph.D.

Dr. Leopold Zoller

Differentiable manifolds (Differential geometry I)

LECTURE WiSEM 2021/2022

as of October 4, 2021

Differential geometry started out in the 19th century as the study of curved spaces (Gauß, Riemann). In its modern form, it provides a flexible language which allows to capture a wide variety of geometric settings as they arise in many branches of mathematics and physics. To name a few, there is a close interaction of differentiable geometry with topology, (complex) algebraic geometry and geometric analysis, and in physics it is used in mechanics, gauge theory, relativity and string theory.

We will discuss manifolds, differential forms and prove Stokes' Theorem. Further topics are de Rham cohomology and basics of Lie groups.

The lecture will be continued in the summer term with an introduction to Riemannian geometry.

For students of mathematics or physics, third year or later.

Prerequisites: First and second year courses in calculus and linear algebra.

References:

L.W. Tu, *An Introduction to manifolds*, Springer 2008

J.M. Lee, *Introduction to smooth manifolds*, Springer 2003

F. Warner, *Foundations of differentiable manifolds and Lie groups*, Springer, 1983

S. Kobayashi, K. Nomizu, *Foundations of differential geometry*, Wiley, 1963

Space-time: Lectures Tuesday+Thursday 10-12 in B 005,

Zentralübung (joint tutorial), Friday 12-14 in B 138,

Tutorials Monday 10-12 in B 252, Di 14-16 in B 134.

The times have been changed to avoid an overlap with classes in physics.