



## Shape and topology optimization using adjoint methods

The course is intended for students interested in shape and topology optimization in the context of computational mechanics. From an application point of view, focus is given in particular to structural mechanics, while fluid dynamics is discussed as well.

A detailed explanation of the adjoint method in its discrete and continuous variant is the core topic of the course. Further, an introduction to Riemannian shape gradients is provided, which gives rise to various shape updates and their extension into the domain.

The main part of the course is divided into four lecture blocks and four programming sessions with an intended duration of three hours each (including breaks). Lectures will take place in the morning and programming sessions in the afternoon. The course will close with a presentation of the problems worked on in the programming sessions and a lecture on current research topics in shape and topology optimization. Participants are expected to have a background in computational mechanics or mathematics with a basic understanding of the finite element method.

In order to participate in the programming projects a laptop and an installation of Docker as described in the repository for the course is required.

**Material:** [https://collaborating.tuhh.de/lars.radtke/course\\_shape\\_and\\_topology\\_optimization](https://collaborating.tuhh.de/lars.radtke/course_shape_and_topology_optimization)

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#### Day 1:

Introduction to optimization  
Programming session I

#### Day 2:

PDE constraints and adjoint  
method  
Programming session II

#### Day 3:

Application scenarios  
Programming session III

#### Day 4:

Topology optimization  
Programming session IV

#### Day 5:

Advanced methods  
and hot-topics

**Dr Lars Radtke**  
**Hamburg University of Technology**

**Dates:** January 22, 23, 24, 25, 26

**Time:** 10:00-13:00 and 14:00-17:00

**Classroom:** MS1, DICAr, Via A. Ferrata, 3