

**M39: Topics in Riemannian Geometry**  
**Humboldt-Universität zu Berlin, Winter Semester 2023-24**

<b>Instructor:</b>	Dr. Shubham Dwivedi Institut für Mathematik (Rud. 25) Room 1.309 <a href="mailto:dwivedis@hu-berlin.de">dwivedis@hu-berlin.de</a>
<b>Website:</b>	<a href="https://s-dwivedi.github.io/TopicsRiemGeom2023.html">https://s-dwivedi.github.io/TopicsRiemGeom2023.html</a>
<b>Moodle:</b>	<a href="https://moodle.hu-berlin.de/course/view.php?id=123761">https://moodle.hu-berlin.de/course/view.php?id=123761</a> enrolment key: riemann
<b>Lectures:</b>	Mondays 11:15 - 12:45 in Room 3.007 Rudower Chaussee 25 (RUD25)
<b>Problem Sessions:</b>	every alternate Mondays starting 30th October 2023 1:15 - 2:45 in 1.114 Rudower Chaussee 25 (RUD25)
<b>Language:</b>	English

### Short Description

This course can be seen as a "second" course in Riemannian geometry. The target audience is advanced Bachelors's and Masters's students and PhD students and basic knowledge of Riemannian geometry and computations involving tensor calculus will be assumed. A (preliminary) discussion of topics is outlined below.

### Topics to be covered

- (1) Basics of Riemannian geometry and Ricci calculus with emphasis on calculations in local coordinates. Curvature-type tensors.
- (2) Comparison theorems in Riemannian geometry.
- (3) The Bochner technique and its applications.

The aforementioned topics are much more than what we'll actually be able to cover in the course.

### Grading

The grades in the course will be decided either by an oral exam or by a typed-up short report on a mutually-decided topic at the end of the semester. We'll decide the exact format once the course starts.

### Literature

There are excellent introductions and more advanced texts on Riemannian geometry and the materials presented in the class will be followed from the references mentioned below. In particular, [dC92], [Pet16], [Jos17], [CLN06] and [CE08] are good sources for self-study as well.

### REFERENCES

- [CE08] Jeff Cheeger and David G. Ebin, *Comparison theorems in Riemannian geometry*, Reprint of the 1975 original, Providence, RI: AMS Chelsea Publishing, 2008 (English). ↑1
- [CLN06] Bennett Chow, Peng Lu, and Lei Ni, *Hamilton's Ricci flow*, Grad. Stud. Math., vol. 77, Providence, RI: American Mathematical Society (AMS), 2006 (English). ↑1
- [dC92] Manfredo Perdigão do Carmo, *Riemannian geometry. Translated from the Portuguese by Francis Flaherty*, Boston, MA etc.: Birkhäuser, 1992 (English). ↑1

- [Jos17] Jürgen Jost, *Riemannian geometry and geometric analysis*, 7th edition, Universitext, Cham: Springer, 2017 (English). [↑1](#)
- [Pet16] Peter Petersen, *Riemannian geometry*, 3rd edition, Grad. Texts Math., vol. 171, Cham: Springer, 2016 (English). [↑1](#)