

RTG Seminar 2019

List of Talks

All page numbers are relative to the main reference [Bott-Tu].

Talk 1: Introduction I: Differential forms (David Degen) (pp. 13–25)

Differential forms, de Rham complex, Mayer-Vietoris sequence for general forms.

Talk 2: Introduction II: Compactly supported differential forms (Johanna Bimmermann) (pp. 17–33)

Compactly supported differential forms, Mayer-Vietoris sequence for compactly supported forms (this can be done rather quickly), Integration and Stokes' theorem (strong focus on this part).

Talk 3: Poincaré lemma and the degree of a map (Jasmin Hörter) (pp. 33–42)

Poincaré lemma (normal and compactly supported), homotopy axiom, cohomology of \mathbb{R}^n and S^n , degree of a map.

Talk 4: Poincaré duality (Kevin Wiegand) (pp. 42–53)

Existence of a good cover, Poincaré duality on an oriented manifold, Poincaré dual of a closed, oriented submanifold, examples (Leave out Leray-Hirsch and Künneth, prove finite-dimensionality of cohomology only if time permits).

Talk 5: Thom-isomorphism for oriented vectorbundles I (Anna-Maria Vocke) (pp. 53–63)

Vector bundles and their orientability, compact vertical cohomology, projection formula.

Talk 6: Thom-isomorphism for oriented vectorbundles II (Benjamin Waßermann) (pp. 64–76)

Thom isomorphism, Poincaré dual and Thom class, Euler class, examples.

Talk 7: Čech-de Rham complex (Irene Seifert) (pp. 89–100)

Čech-de Rham complex, generalized Mayer-Vietoris sequence, general double complexes, applications.

Talk 8: Künneth theorem and Čech cohomology (Arnaud Maret) (pp. 105–113)

Tic-toc-toe proof of Künneth theorem, presheaves, Čech cohomology.

Talk 9: Spectral sequences I (Lenonid Grau) (pp. 155–169)

Exact couples, the spectral sequence of a filtered complex, the spectral sequence of a double complex.

Talk 10: Spectral sequences II (Lucas Dahinden) (pp. 169–179)

Applications of spectral sequences.

References

- [1] Raoul Bott and Loring W. Tu. *Differential forms in algebraic topology*. Graduate Texts in Mathematics. Springer-Verlag, New York-Berlin, 1982.