READING SEMINAR ON CHERN-WEIL THEORY

FRIBOURG, FRÜHLINGSSEMESTER 2017

In this (self-organized) seminar we intend to cover Chern-Weil theory following the famous "Appendix C" in Milnor's and Stasheff's book on characteristic classes [MS74]. If time permits we will try to find interconnections to other presentations of Chern-Weil theory such as [KN96, Chapter XII], [Ebe14, §7], [Dup78], [GHV73, Volume II, Chapter VI–X], [Zha01]. The format is understood as a reading seminar where the presenter assumes the audience to have read through the corresponding topics beforehand.

We plan to meet on a weekly basis starting on **May 3rd, 2017** in the Lonza seminar room at **5 p.m.** (Although the dates for the following weeks are up for discussion.)

As prerequisites we will assume a basic understanding of differential geometry and algebraic topology; everything beyond can be explained according to the audiences background.

The presentations should take around 60 minutes followed or interrupted by about another 30 minutes of discussion. A rough outline of the path towards the Chern-Gauß-Bonnet theorem is given below – in which direction to proceed afterwards will be decided based on our experiences until that point.

I. Recollection of vector bundles and connections (Joé Brendel)
   Wednesday May 3rd, 2017 Lonza 5 p.m.
   (p. 287 – p. 295)

II. Invariant polynomials and cohomology classes (Jan-Bernhard Kordaß)
    (p. 295 – p. 303)

III. The classical Gauß-Bonnet theorem (p. 303 – p. 306)

IV. Chern forms and classes (p. 306 – p. 309)

V. The Chern-Gauß-Bonnet theorem (p. 309 – p. 312)

If you are interested in participating (this of course does not necessarily include to give a presentation), please contact **Joé Brendel** (`joe.brendel@unifr.ch`) or **Jan-Bernhard Kordaß** (`kordass@kit.edu`).

References

[Dup78] Johan L. Dupont, *Curvature and characteristic classes*, Lecture Notes in Mathematics, Vol. 640, Springer-Verlag, Berlin-New York, 1978. MR 0500997

[Ebe14] Johannes Ebert, *Lectures on index theory*, Unpublished lecture notes., 2014.

[GHV73] Werner Greub, Stephen Halperin, and Ray Vanstone, *Connections, curvature, and cohomology. Vol. II: Lie groups, principal bundles, and characteristic classes*, Academic Press [A subsidiary of Harcourt Brace Jovanovich, Publishers], New York-London, 1973, Pure and Applied Mathematics, Vol. 47-II. MR 0336651

[KN96] Shoshichi Kobayashi and Katsumi Nomizu, *Foundations of differential geometry. Vol. II*, Wiley Classics Library, John Wiley & Sons, Inc., New York, 1996, Reprint of the 1963 original, A Wiley-Interscience Publication.

[MS74] John Willard Milnor and Jim Stasheff, *Characteristic classes*, Princeton University Press, 1974.

[Zha01] Weiping Zhang, *Lectures on Chern-Weil theory and Witten deformations*, Nankai Tracts in Mathematics, vol. 4, World Scientific, 2001.