

# The Signature Theorem

Tuesdays, 14:15 — 16:00 Uhr, Seminarraum N0.007

Prof. Dr. S. Schwede, Dr. T. Macko

**Organizational meeting:** 16.07.2013 at 10:15 in N0.003

The aim of the seminar is to present the proof of the Hirzebruch Signature Theorem following (the second part) of the classical book [MS74]. It says that the signature of a  $4k$ -dimensional smooth manifold which is an integer can be expressed as a certain rational linear combination of its Pontrjagin characteristic numbers. It famously provided Milnor with the right tool to show the existence of exotic spheres. Furthermore the Hirzebruch Signature Theorem allows for far reaching generalizations, it is a special case of the Atiyah-Singer Index Theorem.

A prerequisite for the seminar are the courses Topologie I and II. If you took part in a previous seminar on Characteristic classes then you have a good background, but it is not necessary, this seminar will be so designed that you can take part. On the other hand in that case you should be prepared to learn the basics of vector bundles quickly.

Literature: We will mainly use the classical book: [MS74].

## Talks:

- (1) **Grassmann manifolds as classifying spaces** ..... ALEXANDER MEY  
22.10.2013 [MS74, §5]
- (2) **The Thom Isomorphism Theorem** ..... MALTE LACKMANN  
29.10.2013 [MS74, §10]
- (3) **The Euler class and the Gysin Sequence** ..... LUKAS RICHTER  
05.11.2013 [MS74, §9,12] part 2
- (4) **Complex vector bundles and Chern classes** ..... IULIA SEMIKINA  
12.11.2013 [MS74, §13,14] up to p. 159 Complex Grassmann manifolds
- (5) **Complex Grassmann manifolds** ..... DHYAN ARANHA  
19.11.2013 [MS74, §14]

- (6) **Pontrjagin classes and the oriented Grassmann manifolds** ..... TIMM VON PUTTKAMER  
26.11.2013 [MS74, §15]
- (7) **Chern numbers and Pontrjagin numbers** ..... MALTE LEIP  
03.12.2013 [MS74, §16]
- (8) **The oriented cobordism ring  $\Omega_*$**  ..... FRANK ZICKENHEINER  
10.12.2013 [MS74, §17]
- (9) **The Pontrjagin-Thom construction and transversality** ..... FABIAN HENNEKE  
17.12.2013 [MS74, §18]
- (10) **The homotopy groups of Thom spaces** ..... RUBEN FISCHER  
07.01.2014 [MS74, §18]
- (11) **Multiplicative sequences and the signature theorem** ..... NGUYEN KIM  
14.01.2014 [MS74, §19]
- (12) **Connections, curvature and characteristic classes I** ..... JENS REINHOLD  
21.01.2014 [MS74, Appendix C]
- (13) **Connections, curvature and characteristic classes II** ..... HENRIK MATTHIESEN  
28.01.2014 [MS74, Appendix C]

LITERATUR

[MS74] John Milnor and James D. Stasheff. *Characteristic classes*. Princeton University Press, Princeton, N. J., 1974. Annals of Mathematics Studies, No. 76.