

Seminar: Kähler manifolds

Winter term 2017/18

Prof. Bernd Ammann

Monday 16-18

This is a preliminary schedule. The precise schedule will depend on the participants.

1 Riemannian geometry

This part of the seminar addresses to participants who are not yet familiar with Riemannian geometry. For these participants it is recommended that they follow simultaneously the lecture on symplectic geometry, at least the beginning. When the seminar starts, participants should be familiar with Chapter 1 and 2 of the book [2]. In the lecture on symplectic geometry Chapter 3 [2] will be discussed in the first weeks. Further literature for this part will be given to the speakers after the distribution of talks.

Talk no. 1: Principal bundles and vector bundles. *Date: will be fixed later.*

N.N..

[2, Chap. 4]

Talk no. 2: Connections. *Date: will be fixed later.* N.N..

[2, Chap. 5]

Talk no. 3: Riemannian manifolds. *Date: will be fixed later.* N.N..

[2, Chap. 6]

2 Complex manifolds and complex geometry

This part is the center of the seminar. Here the participants should learn the basic definitions, constructions and results for complex manifolds

Talk no. 4: Complex and holomorphic structures. *Date: will be fixed later.*

N.N..

[2, Chap. 7 and 8]. Maybe split in two talks.

Talk no. 5: Vector bundles with complex, holomorphic and hermitian structures. *Date: will be fixed later.* N.N..

[2, Chap. 9 and 10]

Talk no. 6: Hermitian and Kähler metrics. *Date: will be fixed later.* N.N..

[2, Chap. 11]

Talk no. 7: Curvature of Kähler metrics and examples. *Date: will be fixed later.* N.N..

[2, Chap. 12 and 13]

Talk no. 8: Laplace operators. *Date: will be fixed later.* N.N..
[2, Chap. 14]

Talk no. 9: Hodge and Dolbeault theories. *Date: will be fixed later.* N.N..
[2, Chap. 15]

Supplementary Talk no. 1: Characteristic classes *Date: will be fixed later.*
N.N..
Will be fixed later, e.g. following [2, Chap. 16]

Talk no. 10: The Hirzebruch-Riemann-Roch formula. *Date: will be fixed later.* N.N..

In this talk we discuss the Hirzebruch-Riemann-Roch formula as a special case of the Atiyah-Singer index theorem. The talk will probably fill two sessions. The talk should be given by someone who is already familiar with the Atiyah-Singer index theorem, to combine this with Moroianu's book. See [2, Chap. 21]

3 Advanced topics

We now shall discuss some more advanced topics. If we start the seminar with the introduction to Riemannian geometry, we will not have time for this part, then the seminar will end at this point and we may discuss to continue the seminar in the summer term.

The exact program will be fixed later. Possible topics are

- Applications of the Hirzebruch-Riemann-Roch formula
- Kodaira embedding theorem
- The Calabi-Yau theorem

Seminar-Homepage

<http://www.mathematik.uni-regensburg.de/ammann/kaehler>

Literatur

- [1] BALLMANN, W. Lectures on Kähler manifolds. ESI Lectures in Mathematics and Physics. European Mathematical Society (EMS), Zürich, 2006.
- [2] MOROIANU, A. Lectures on Kähler geometry, vol. 69 of London Mathematical Society Student Texts. Cambridge University Press, Cambridge, 2007.