

Bundles and Connections

(Marco Zambon)

Schedule: From 6 to 10 May 2013, 16:30-18:30. Aula Gris, ICMAT/IFT.

Lecture notes:

http://www.uam.es/personal_pdi/ciencias/mzambon/MiniCourseBundles13.html

Content of the minicourse:

- 1) Fiber bundles [[KMS93](#), Section 9]
 - 1.1 Fiber bundles
 - 1.2 Connections
 - 1.3 Curvature
- 2) Vector Bundles [[Jos98](#), Ch. 1.5]
 - 2.1 Vector bundles
 - 2.2 Bundle metrics
- 3) Principal bundles [[Jos98](#), Ch. 1.7]
 - 3.1 Lie groups
 - 3.2 Principal bundles
 - 3.3 Frame bundles and associated bundles
- 4) Connections on vector bundles
 - 4.1 Covariant derivatives [[Ler](#)]
 - 4.2 Connections and curvature [[Jos98](#), Ch. 3.1]
- 5) Connections on principal bundles [[Mor96](#), Ch. 3.2]
 - 5.1 Connections
 - 5.2 Curvature
- 6) Remarks on Chern classes
 - 6.1 Chern classes [[Hat](#), Ch. 3.1][[BT82](#), Ch. 4][[MS74](#)]
 - 6.2 Chern-Weil theory [[Jos98](#), Ch. 3.2]

REFERENCES

- [BT82] Raoul Bott and Loring W. Tu. *Differential forms in algebraic topology*, volume 82 of *Graduate Texts in Mathematics*. Springer-Verlag, New York, 1982.
- [Hat] Allen Hatcher. Vector bundles and k theory. available at <http://www.math.cornell.edu/~hatcher/VBKT/VBpage.html>.
- [Jos98] Jürgen Jost. *Riemannian geometry and geometric analysis*. Universitext. Springer-Verlag, Berlin, second edition, 1998.
- [KMS93] Ivan Kolář, Peter W. Michor, and Jan Slovák. *Natural operations in differential geometry*. Springer-Verlag, Berlin, 1993. available at <http://www.emis.de/monographs/KSM/kmsbookh.pdf>.
- [Ler] Eugene Lerman. Connections and curvature notes. *available at* <http://www.math.uiuc.edu/~lerman/519/s11/conn.pdf>.

This document: http://www.uam.es/personal_pdi/ciencias/mzambon/BC13/Programa.pdf

- [Mor96] John W. Morgan. *The Seiberg-Witten equations and applications to the topology of smooth four-manifolds*, volume 44 of *Mathematical Notes*. Princeton University Press, Princeton, NJ, 1996.
- [MS74] John W. Milnor and James D. Stasheff. *Characteristic classes*. Princeton University Press, Princeton, N. J., 1974. Annals of Mathematics Studies, No. 76.