Advanced geometry. Introduction to differential geometry (Jérémy Toulisse).

The goal of this course will be to give a general introduction to differential geometry (more specifically, differential topology and Riemannian geometry). We will cover some important aspects of differential geometry that are fundamental in many different areas of research, and this course will be intimately connected with the other courses of the Algebra-Geometry Bloc.

More specifically, we aim to cover:

- Theory of smooth manifolds: vector fields, differential forms, Frobenius theorem.
- Theory of vector bundles, Euclidean and Hermitian metrics, connections, curvature.
- Riemannian metrics, Levi-Civita connection, geoedesics, Riemann curvature tensor.
- Riemannian submanifolds, second fundamental form, Gauss, Ricci and Codazzi equations
- Comparison theorems in Riemannian geometry (if time permits).

The following references may be useful

(1) Paulin, *Groupes et Géométrie* (available of his webpage).
(2) Gallot, Hulin, Lafontaine. *Riemannian Geometry* - Springer 2004.
(3) Kobayashi, Nomizu. *Foundations of Differential Geometry Vol. I* - 1996.