Topics in Differential Geometry I – Symplectic geometry

Instructor: Gábor Székelyhidi
MWF 12:50 – 1:40, Spring 2014
Nieuwland Science Hall 127

This course will be an introduction to symplectic geometry, including an overview of some recent developments. The original motivation for the subject came from Hamiltonian dynamics, but symplectic geometry has found applications in many fields of mathematics, and has developed into a deep subject of its own.

The main topics covered will be the following:

- Symplectic manifolds, complex structures, local structure theorems (Darboux, Moser, Weinstein).
- Constructions of symplectic manifolds: Kähler manifolds, blowups, connected sums, symplectic reduction.
- Almost holomorphic techniques, existence of Lefschetz pencils.
- Pseudoholomorphic curves, proof of Gromov's non-squeezing theorem, capacities.

References: The main references are the following, but as the course progresses I will provide more specialized references for certain topics.

- McDuff-Salamon, *Introduction to Symplectic Topology*, 2nd edition, 1998.
- da Silva, *Lectures on Symplectic Geometry*, `www.math.ist.utl.pt/~acannas/Books/lsg.pdf`

Grading policy: There will be 3 or 4 homework assignments. The grade will be based on class attendance, and effort put into the homework assignments.
Prerequisites: I will assume familiarity with basic concepts in differential geometry and topology. Some prior exposure to complex manifolds is useful but not a strict requirement.