

## MATH 8230: SYMPLECTIC TOPOLOGY SYLLABUS

**Instructor:** Mike Usher

**Scheduled class meetings:** MWF 11:15-12:05 in Boyd 410.

**Office Hours:** after class, or by appointment.

**Textbook:** *J-holomorphic curves and symplectic topology* by Dusa McDuff and Dietmar Salamon. AMS Colloquium Publications vol. 52, 2004. ISBN 0821834851.

**Other possibly-useful references:**

- *Holomorphic curves in symplectic geometry*, ed. by Audin and Lafontaine (Birkhauser, 1994) has some useful articles originating from a summer graduate workshop in the early '90s.
- For the Floer theory part of the course, Salamon's *Lectures on Floer homology* (in the proceedings of the 1997 Park City summer school on Symplectic Geometry and Topology, and also downloadable from Salamon's webpage) may be helpful.
- It feels obligatory to mention the founding document of the subject, Gromov's paper "Pseudo holomorphic curves in symplectic manifolds" (Invent. Math. **82** (1985) 307–347), which contains many of the fundamental ideas that we'll be discussing; however the proofs in that paper tend to be hard to understand.

**Grading:** Grades will be based on attendance/participation and on a final project consisting of an oral presentation on an application of your choice of the theory of pseudoholomorphic curves to symplectic geometry/topology.

**Topics:** The course will deal with pseudoholomorphic curves (and with versions of Floer homology that are based on them), which in the 25 years since their introduction by Gromov have become probably the most powerful tool for proving results in symplectic geometry and topology.

- **Analytic foundations:** Energy, regularity, removal of singularities, compactness and bubbling, Fredholm theory, transversality.
- **Gromov-Witten invariants and related applications:** Construction of invariants (at least in simple cases), the non-squeezing theorem, enumeration of curves in  $\mathbb{C}P^2$ .
- **Floer homology:** Lagrangian and Hamiltonian formulations, Arnold's conjecture, restrictions on Lagrangian submanifolds, applications to Hofer geometry.

**Obligatory language:** As a University of Georgia student, you have agreed to abide by the University's academic honesty policy, A Culture of Honesty, and the Student Honor Code. All academic work must meet the standards described in A Culture of Honesty found at: [www.uga.edu/honesty](http://www.uga.edu/honesty). Lack of knowledge of the academic honesty policy is not a reasonable explanation for a violation. Questions related to course assignments and the academic honesty policy should be directed to the instructor.

The course syllabus is a general plan for the course; deviations announced to the class by the instructor may be necessary.