Math 993 Spring 2017

Harmonic and J-Holomorphic Maps

Class meets: 12:40 – 1:30 MWF in C-304 Wells Hall.

Professor: T. Parker
Office: C-346 Wells Hall 353-8493
parker@math.msu.edu

Office hours: Monday: 1:30-2:30
Wednesday 3-4
Friday 2-3

Class Web page: math.msu.edu/~parker/HHM.

This course covers both harmonic and J-holomorphic maps. One goal is to include new approaches to the issue of bubbling and conformal invariance.

Prerequisites: A working knowledge of (i) Riemannian geometry and (ii) elliptic PDE at the level of Evans' Chapters 5 and 6.

Course Content: The following is a tentative outline of the course, in order.

1. Harmonic maps
2. Symplectic geometry and topology
3. J-holomorphic maps
4. Riemann surfaces
5. Complex curves
6. Gromov-Witten moduli spaces
7. Analysis results and regularity
8. Bubbling
9. Polarized symplectic manifolds
10. Gromov compactness theorem.
11. Virtual fundamental classes and GW invariants.
12. Harmonic map heat flow.

Textbook: *Riemannian Geometry and Geometric Analysis*, by Jurgen Jost.

Additional books: The following books are cover the same topics, with varying styles.

1. Fanghua Lin and Changyou Wang, *The analysis of harmonic maps and their heat flows.*
2. D. McDuff and D. Salamon, *J-holomorphic curves and quantum cohomology.* ("short book")
3. D. McDuff and D. Salamon, *J-holomorphic curves and symplectic topology.* ("big book")

Grades: Course grades will be based on homework assignments and on team projects. (The nature of the projects will be explained in class).