

COMPREHENSIVE EXAM SYLLABUS

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Subject. *Surgery in Mean Curvature Flow*

Preliminaries. *Riemannian geometry:*

- *connection, riemannian curvature*
- *sectional curvature, Ricci curvature*
- *comparison theorems*

Geometry of submanifolds:

- *variation of submanifolds*
- *riemannian geometry of hypersurfaces, Codazzi and Gauss equations, Simons' identity*
- *convexity conditions for hypersurfaces*

Analytic techniques:

- *iteration: Moser and Stampacchia methods*
- *Michael-Simon sobolev inequality*

Topics. *mean curvature flow:*

- *definition, examples, short-time existence*
- *evolution of geometric objects*
- *maximum principles and preserved conditions*
- *approximation by nearby special solutions*
- *the rescaled flow*
- *singularity structure of meanconvex flows, convexity estimates*
- *Hamilton necks, Huisken-Sinestrari necks*
- *Huisken-Sinestrari's surgery theorem*

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- [4] Richard Hamilton. The harnack estimate for the mean curvature flow. *J. Diff. Geom.*, 41:215–226, 1995.
- [5] Richard Hamilton. Four-manifolds with positive isotropic curvature. *Communications in Analysis and Geometry*, 5:1–92, 1997.
- [6] Gerhard Huisken and Carlo Sinestrari. Convexity estimates for mean curvature flow and singularities of mean convex surfaces. *Acta Mathematica*, 183:45–70, 1999.
- [7] Gerhard Huisken and Carlo Sinestrari. Mean curvature flow singularities for mean convex surfaces. *Calculus of Variations and Partial Differential Equations*, 8:1–14, 1999.
- [8] Gerhard Huisken and Carlo Sinestrari. Mean curvature flow with surgeries of two-convex hypersurfaces. *Inventiones Mathematicae*, 2008.
- [9] Gerhard Husiken. Flow by mean curvature of convex hypersurfaces into spheres. *J. Diff. Geom.*, 20:237–266, 1984.
- [10] James Michael and Leon Simon. sobolev and mean value inequalities on generalized submanifolds of R^n . *Comm. Pure and Applied Math.*, 26:316–379, 1973.
- [11] Guido Stampacchia. *Équations Elliptiques du second ordre à coefficients discontinus*. les presses de l'université de montréal, 1966.