

THE CHINESE UNIVERSITY OF HONG KONG
Department of Mathematics
MATH 6022B (Second term, 2022-23)
Topics in Geometry II
Course Outline

Course Description

This is a graduate level topics course on geometry. This term we will focus on the geometric and analytic aspects of mean curvature flow. This flow occurs in the description of the evolution of numerous physical models where the energy is given by the area of the interfaces. It also serves as a fundamental example that drives a lot of development in geometry and partial differential equations. In this course, we will give an overview of some foundational results like the evolution equations of geometric quantities and the convergence theorems of Gage-Hamilton and Huisken. We will also discuss about the analysis of singularities, both in the classical and weak setting, focusing mainly on the mean-convex case. We shall assume as prerequisite a working understanding of Riemannian Geometry (at the level of MATH5061), as well as basic knowledge on elliptic partial differential equations (at the level of MATH5022). In particular, prior exposure to other geometric flows (e.g. Ricci flow) is helpful but not absolutely required.

Instructor

- LI Man-chun Martin (Office: LSB 236. Email: martinli@math.cuhk.edu.hk)

Time and Venue

- **Lectures:** Mondays 2:30-5:15PM
- **Venue:** LSB 222

Assessment Scheme

- **Final Essay/Presentation:** 100%

You have to submit a mathematical essay on a proposed topic by the end of the semester. There is no prescribed length for the essay, but a reasonable range is something between 5000-8000 words. The deadline to submit the essay (by email) is **May 6, 2023**. One week before the submission deadline, i.e. during the lecture time on **Apr 24, 2023**, you will give a presentation for an overview of the content of your essay. Some suggested topics for the essay and other details will be announced during the semester.

Course Webpage

Please check regularly the following course webpage for course materials and announcements:

<http://www.math.cuhk.edu.hk/course/2223/math6022b>

Textbook and References

Some good references for the topics I plan to cover in this course include:

- Carlo Mantegazza, *Lecture Notes on Mean Curvature Flow*, Progress in Mathematics Vol. 290, Birkhäuser
- Brian White, *Topics in mean curvature flow*, lecture notes by Otis Chodosh
- Felix Schulze, *Introduction to Mean Curvature Flow*, lecture notes at LSGNT
- B. Andrews, B. Chow, C. Guenther & M. Langford, *Extrinsic Geometric Flows*, Graduate Studies in Mathematics Vol. 206, AMS