

# MATH 822: Topics in Geometry

Spring 2016 Syllabus

T-TH 9:30-11:00, PSY B40

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**Office hour:** Wednesday 1-4pm

## Overview:

The main theme this year is **toric geometry and mirror symmetry**. Toric manifolds are Kaehler manifolds built from **polytopes**, and a lot about their geometries can be easily read off from polytopes. The most fundamental example is the **complex projective space**. It provides the most efficient way to construct **Calabi-Yau manifolds**, which play a fundamental role in string theory and mirror symmetry. We will take a survey on several papers in mirror symmetry based on toric geometry. In particular we will introduce the **mirror theorem by Givental and Lian-Liu-Yau**.

## Prerequisites:

A curious mind. The level varies throughout the course. Basically we will learn the 'prerequisites' all together along the course (and indeed skip most of them).

## References:

*Cox and Katz – Mirror Symmetry and Algebraic Geometry*

*Guillemin – Kaehler structures on toric varieties*

*Iritani – Real and integral structures in quantum cohomology I: toric orbifolds*

*Iritani – A mirror construction for the big equivariant quantum cohomology of toric manifolds*

*Mann; Mignon - Quantum D-modules for toric nef complete intersections*

*... we will introduce references throughout the course.*

## Exam:

There will be no exam. The best of this course is that it has a lot of excellent examples which illustrate the general theory very well. You will be asked to present one of the examples and some of its geometric structures (for instance, line bundles and sections, cohomology, Landau-Ginzburg mirrors, quantum D-modules, I and J functions, Jacobian rings...)