MATH 571 ADVANCED TOPICS IN ALGEBRAIC GEOMETRY: K3 SURFACES

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Welcome to Math 571! This course is an introduction to K3 surfaces. It will cover linear systems on K3 surfaces, the Torelli Theorem, moduli spaces of sheaves on K3 surfaces and recent advances thanks to Bridgeland stability conditions.

Course webpage: http://www.math.uic.edu/˜coskun/math571f20.html

Venue: Online through Blackboard and Zoom

Office hours: MWF 10:30-11:00 and 12:00-12:30 on zoom and by appointment.

Text: The main text for this course will be Lectures on K3 surfaces by Daniel Huybrechts (abbreviated LK3). There will be several supplementary texts including Compact Complex Surfaces by Barth, Hulek, Peters and Van de Ven, Complex Algebraic Surfaces by Beauville and Moduli of Sheaves by Huybrechts and Lehn. The second half of the course will be based on recent research papers.

Prerequisites: A year of algebraic geometry at the level of Hartshorne or Griffiths and Harris.

Requirements: The grade will be entirely based on homework. I will regularly assign problems that will be due on Fridays.

Topics: The following is a tentative list of topics that will be covered in the course. Please read the suggested chapters before class.
- Week 1: An introduction to K3 surfaces, examples and basic properties (LK3 Chapters 1, 3)
- Week 2: Linear systems on K3 surfaces (LK3 Chapter 2)
- Weeks 3-4: Vector bundle techniques for proving Brill-Noether and Petri Theorems (LK3 Chapter 9)
- Weeks 5-6: Hodge Theory and the Torelli Theorem (LK3 Chapters 6,7)
- Week 7: Ample and effective cone of curves and the cone conjecture (LK3 Chapter 8)
- Weeks 8-9: Moduli spaces of sheaves on K3 surfaces (LK3 Chapter 10)
- Weeks 10-13: Bridgeland stability conditions (LK3 Chapter 16)
- Weeks 14-15: Applications of Bridgeland stability conditions to moduli spaces of sheaves