Math 790STA - Abelian Varieties - Spring 2023
Mondays and Wednesdays 8:40 → 9:55 AM

Instructor: Eyal Markman
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Course Web page: http://www.math.umass.edu/~markman/
Office hours: Monday 11:00 am → noon, Wednesday 10:00 am → 11:00 am, and by appointment.

Prerequisites: Math 611 and 612 or equivalent, Math 621 or equivalent, Math 703 or equivalent, and a graduate level course in algebraic geometry. Familiarity with de Rham and Dolbeault cohomology will be assumed.

Course Plan, week by week:

1. Line bundles on complex tori.

2. Theta functions, the Vanishing theorem.

3. Cohomology of line bundles, the Riemann-Roch theorem.

4. Polarized abelian varieties, the Riemann relations, the Decomposition theorem.

5. Projective embeddings and Lefschetz' theorem.

6. Symmetric line bundles and divisors.

7. Endomorphisms of abelian varieties.

8. Theta groups, Heisenberg groups, and the Schrödinger represenation.

9. Equations for abelian varieties.

10. Moduli spaces of abelian varieties.

11. The Jacobian variety.

12. Fourier-Mukai transformation.

13. The Torelli theorem.

References: We will not follow a specific reference, rather use several references for different chapters, including the ones listed below and notes of varieous authors available on line.

1. Complex Abelian Varieties, by Christina Birkenhake and Herbert Lange, 1992.

2. Abelian Varieties, by David Mumford, 1970.

3. Abelian varieties, Theta functions, and Fourier Transforms, by Alexander Polishchuk, 2003.

Homework: Will be assigned biweekly. Group work is encouraged, but individual papers should be submitted.

Grades: Will be determined by each student's individual progress as manifested in the homework.

Accommodation: The University of Massachusetts Amherst is committed to making reasonable, effective and appropriate accommodations to meet the needs of students with disabilities and help create a barrier-free campus. If you have a disability and require accommodations, please register with Disability Services (161 Whitmore Administration building; phone 413-545-0892) to have an accommodation letter sent to your faculty. Information on services and materials for registering are also available on their website www.umass.edu/disability.

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