

MATH 513

Algebraic Geometry

(2020 Spring Semester)

by
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Prerequisites: Consent of the instructor

Credits: (3-0)3 / 7 ECTS

Outline(tentative): The main aim in this class is to study the relationship between theta functions of binary quadratic forms and Maass wave forms. The course will therefore comprised of many different subjects. In the first part of the course the objects we will study will be of analytic nature. The topics covered in the final part of the lecture will be a little more advanced.

As we progress, I will mention some topics for individual projects. Each student is expected to choose one and present it.

Some prior knowledge on complex functions and algebra will be assumed. The following is a tentative weekly outline :

- 3 weeks Dirichlet series, Gamma Function, Characters and L-series
- 2 weeks Zeta and L-functions of number fields, the quadratic case
- 2 weeks Integral quadratic forms and their theta functions
- 2 weeks Modular forms and theta functions
- 2 weeks Dirichlet L-functions associated to modular forms
- 3 weeks Theta functions as modular forms, Laplacian, eigenvalues and Maass forms

Bibliography:

- Zagier, *Zetafunktionen und quadratische Zahlkörper*
- Jacobson & Williams, *Solving the Pell equation*
- Buchmann & Vollmer, *Binary quadratic forms*
- Miyake, *Modular Forms*
- Cohen, Strömberg, *Modular Forms*
- Mumford, *Tata lectures on theta*
- Bellman, *A brief introduction to theta functions*

Program: Monday, 09h00 - 12h00 H305

Evaluation:

- Presentations: %50
- Final: % 50