SEMINAR ON DRINFELD MODULES - WINTER 2004

The Seminar on Drinfeld Modules will resume its weekly meetings on Friday, January 16. During the Winter Quarter, the seminar will meet every Friday at 3:00pm in AP&M 6436 (if available) or AP&M 6218 (otherwise).

First meeting: Friday, January 16, 3:00pm. Location: AP&M 6436.
Speaker: Caleb Emmons
Title: Drinfeld modules over fields of arbitrary genus.

I am attaching below a copy of the first announcement (posted in September 2003), which gives a brief description of the seminar's format and main goals. Last quarter, we covered the following topics: Explicit Local Class Field Theory (via Lubin-Tate formal groups); Non-explicit Global Class Field Theory (in id\'ele and ideal theoretic language); Carlitz modules and explicit Class Field Theory for genus 0 function fields (via torsion points of Carlitz modules) – i.e. the first paper listed in the bibliography below. This quarter, we plan on covering the last two papers listed in the bibliography, focusing on the construction and properties of rank one Drinfeld modules over function fields of arbitrary genus and their applications to explicit class field theory and special values of L-functions.

If you are interested in attending and/or lecturing in this seminar, please e-mail me or Stefan Erickson, so we can add your name to the mailing list. So far, the following people have expressed interest. **Graduate Students:** Frank Chang, Caleb Emmons, Stefan Erickson, Jacek Nowacki, Barry Smith. **Faculty and Research Mathematicians:** K. Baur, W. T. Gan, D. Goldstein (CCR West), T. Hanke, K. Lauter (Microsoft), C. Popescu, A. Terras, A. Wadsworth, N. Wallach.

Cristian Popescu

FIRST ANNOUNCEMENT (September 2003)

During the next two quarters (Fall 03 and Winter 04), Stefan Erickson and I will run an informal seminar on Drinfeld Modules and their applications to Algebraic Number Theory. Although the seminar is aimed primarily at interested graduate students, we would like to welcome all the interested faculty members as well. With very few exceptions, the lectures will be given by graduate students and will be based on three papers by David Hayes (see bibliography below). The volunteering speakers will receive my help in choosing their lecture topics and preparing their lectures.

Brief Description:
The general theory of Drinfeld modules was developed independently by V. Drinfeld and D. Hayes in the 1970s, although the first example was constructed and studied in detail by L. Carlitz as early as 1935. Drinfeld modules are objects which live over characteristic p global fields (i.e. finite extensions of a rational field in one variable over a finite field). The so called rank one Drinfeld modules have two main striking applications to the arithmetic of function fields:

1. Their torsion points generate the maximal abelian extension of the base field, providing this way a solution to the characteristic p half of one of the most important problems in number theory – explicit class field theory (Kronecker's Jugentraum), which is still far from being fulfilled in characteristic 0;

2. Their torsion points lead to an explicit arithmetic/geometric interpretation of special values of L-functions for function fields. This leads to a beautiful proof of the characteristic p half of the rank 1 Stark Conjecture - another central problem in number theory, still far from being solved in characteristic 0.

The seminar will focus mainly on the two applications described above. Time permitting, we will also cover a recent application of Drinfeld modules to public-key cryptography, due to X. Roblot and his collaborators.

Bibliography:

1. Hayes, D.R., Explicit Class Field Theory for Rational function fields, Transactions of the AMS, vol. 189, 1974, pp.77-91.
2. Hayes, D.R., Explicit Class Field Theory in Global Function Fields, Studies in Alg. and Number Thry. – Advances in Math. Suppl. Studies, vol. 6, 1979, pp. 173-217.
3. Hayes, D.R., Stickelberger Elements in Function Fields, Comp. Math. 55 (1985), pp. 209-239.

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