

# ISU ALGEBRA SEMINAR



## SPRING 2018 SCHEDULE

Thursdays, 1:00 PM-1:50 PM at STV 352

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**Date: February 15, 2018**

**Speaker: Professor Fusun Akman**

**Talk Title: Hiding in Plain Sight: Polynomials in Base  $x$**

**Abstract:** The little-known Cohn's Irreducibility Criterion for polynomials with integer coefficients and its generalization connect primes to irreducibles, and integral bases to the variable  $x$ . As we follow this link, we find that these polynomials are ready to spill two of their secrets: (i) There exists a unique "base- $x$ " representation of such polynomials that makes the ring into an ordered domain (every polynomial has a predecessor and a successor, obtained by subtracting/adding 1), and (ii) There is a 1-1 correspondence between positive rational primes  $p$  and certain infinite sets of irreducibles  $f(x)$  that attain the value  $p$  at sufficiently large  $x$ , each generated in finitely many steps from the  $p$ -th cyclotomic polynomial. The base- $x$  representation provides practical conversion methods among numeric bases (not to mention a polynomial factorization algorithm and an irreducibility test), while the prime-irreducible correspondence puts a new angle on the Bouniakowsky Conjecture, a generalization of Dirichlet's Theorem on Primes in Arithmetic Progressions. This conjecture, BTW, states that all irreducible polynomials like  $x^2+1$  must attain infinitely many prime values. Simple, eh? (Exercise for the attendees.)

The talk will be undergraduate-friendly and many definitions/examples will be provided.

