TEMPLE UNIVERSITY
Department of Mathematics

Applied Mathematics and Scientific Computing Seminar

Wednesday, 20 September 2017, 4:00 p.m.
Room 617 Wachman Hall

(refreshments and social at 3:45 p.m)

Some new vector spaces of possible linearizations for matrix polynomials

by Heike Fassbender
TU Braunschweig, Germany

Abstract. Polynomial eigenvalue problems (PEPs) $P(\lambda)x = 0$, where

$$P(\lambda) = \sum_{i=0}^{k} \lambda^i A_i$$

with real or complex $n \times n$ coefficient matrices A_i, appear in a large number of applications. The classical approach to investigating PEPs is linearization, where the polynomial is converted into a larger matrix pencil with the same eigenvalues.
About a decade ago, the vector space $\mathbb{L}_1(P)$ of matrix pencils corresponding to a matrix polynomial $P(\lambda)$ was introduced. Its elements satisfy a certain ansatz equation and may be regarded as generalizations of the Frobenius companion pencils. This vector space contains a great many of (structured) strong linearizations of $P(\lambda)$.
We will first review $\mathbb{L}_1(P)$. Then we will present a generalization of $\mathbb{L}_1(P)$ to matrix polynomials in orthogonal basis. Next we will derive a new family of ansatz spaces which allows to treat nonsquare matrix polynomials. In both cases the proposed novel vector spaces serve as an abundant source of (structured) strong linearizations.