**23rd April: 12.00-13.00, Room: AG07**

**Speaker: Dr Thomas Berger**

Universität Hamburg, Germany

**Systems & Control:***“On the regularization of linear time-invariant descriptor*

*systems”*

**Abstract:**

For linear time-invariant descriptor systems we consider the question whether there exists a feedback which renders the closed-loop system regular. This property can be equivalently characterized by simple algebraic and geometric conditions in terms of the involved matrices and the augmented Wong sequences. We also consider the slightly more general problem of existence of a feedback such that an autonomous closed-loop system is obtained. The corresponding feedback matrices can be constructively obtained using a feedback canonical form due to Loiseau et al., Feedback canonical forms of singular systems, 1991. For systems which are not regularizable by feedback, an additional behavioral equivalence transformation and a reorganization of input and state variables leads to a regular system, the index of which is at most one. This procedure is known (see Campbell et al., Regularization of linear and nonlinear descriptor systems, 2012), however we present a new approach which allows for a detailed characterization of the resulting regular system. We show that this system is fully determined by the augmented Wong sequences, which in particular allows for a simple calculation of the number of redundant equations, free state variables and constraint input variables independent of the transformation of the system.

**Bio**

Thomas Berger received his Bachelor of Science in Mathematics (2008) and his Master of Science in Mathematics and Business Mathematics (2010) from Technische Universität Ilmenau, Germany. During his PhD studies he was a research assistant at the Analysis and Systems Theory group and did his research in the course of the DFG project "Time-varying and switched differential-algebraic equations". From September 2011 to February 2012 he was at the City University London, UK, for a research visit and coorporation with Professor Nicos Karcanias. In 2013 he received his PhD in Mathematics from Technische Universität Ilmenau. He was awarded the "Förderpreis 2013" of the Förder- und Freundeskreis der TU Ilmenau e. V. for his dissertation. Since December 2013 he is a postdoctoral research assistant at the Universität Hamburg, Germany.