MATEMATISKA INSTITUTIONEN
STOCKHOLMS UNIVERSITET
Avd. Matematik

SJÄLVSTÄNDIGT ARBETE I MATEMATIK

Fredagen den 29 april kl. 10.00–11.00 **(observera dagen!)** presenterar Mohammad Monir Uddin sitt arbete "Model reduction for piezo-mechanical systems using balanced truncation" (30 högskolepoäng, avancerad nivå).

Handledare: Peter Benner

Plats: Sal 21, hus 5, Kräftriket

Abstract: In today's scientific and technological world, physical and artificial processes are often described by mathematical models in order to use for simulation, optimization or control. As the mathematical models get more detailed and different coupling effects are to include, the development of efficient simulation and optimization tools for a large-scale coupled system becomes a difficult task. Such large-scale systems contain several subsystems. The subsystems usually have a large number of internal variables which lead to large memory requirements and computational complexity. To handle these large systems efficiently, in simulation, control and optimization, model order reduction (MOR) is essential. The main idea of model order reduction is to approximate a large-scale system by a reduced model of lower state space dimension that has the same behavior, as the original system. Recently, the system-theoretic method Balanced Truncation (BT)", which was believed to be applicable only to moderately sized problems, has been adapted to really large-scale problems. Moreover, it also has been extended to so-called descriptor systems, i.e., systems whose dynamics obey differential-algebraic equations. In this thesis, a BT algorithm is developed for MOR of index-1 descriptor systems based on several papers from the literature. It is then applied to the setting of a piezo-mechanical system. The algorithm is verified by real-world data describing micro-mechanical piezo-actuators. Several numerical experiments are used to illustrate the efficiency of the algorithm.

Alla intresserade är välkomna!