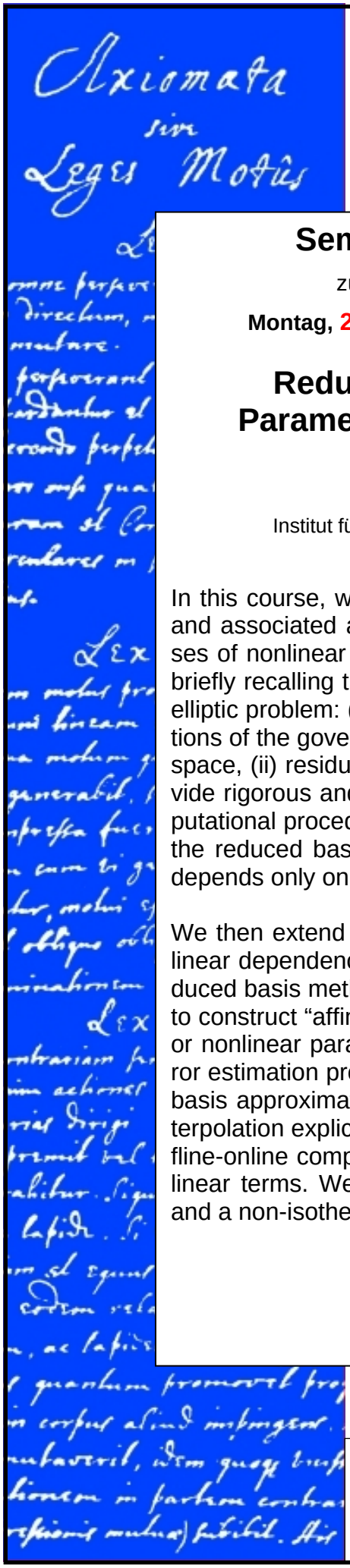

FRIEDRICH-ALEXANDER UNIVERSITÄT ERLANGEN-NÜRNBERG
TECHNISCHE FAKULTÄT

Seminar über Fragen der Mechanik

zu folgendem Vortrag wird herzlich eingeladen

Montag, 22.05.2017, 14:15 Uhr, Egerlandstr. 5, Raum 0.044

Reduced Basis Methods for Nonlinear Parametrized Partial Differential Equations

Prof. Dr. Martin Grepl

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In this course, we present an overview of reduced basis approximations and associated a posteriori error estimation procedures for certain classes of nonlinear parametrized partial differential equations. We begin by briefly recalling the essential reduced basis ingredients for a linear affine elliptic problem: (i) Galerkin projection onto a subspace spanned by solutions of the governing equation at N greedily selected points in parameter space, (ii) residual based a posteriori error estimation procedures to provide rigorous and sharp bounds for the error, and (iii) offline-online computational procedures to decouple the generation and evaluation stage of the reduced basis method, i.e., the operation count in the online stage depends only on the dimension of the reduced order model.

We then extend these ideas to problems involving a nonaffine and nonlinear dependence on the field variable. To this end, we combine the reduced basis method with the empirical interpolation method (EIM) - a tool to construct “affine” coefficient-function approximations of the “nonaffine” or nonlinear parameter dependent functions. We discuss a posteriori error estimation procedures which take the error introduced by the reduced basis approximation and the error induced by the coefficient function interpolation explicitly into account. The EIM allows to derive an efficient offline-online computational procedure even in the presence of highly nonlinear terms. We present numerical results for several model problems and a non-isothermal reaction-diffusion model to validate our approach.

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