Mathematical Sciences Colloquium

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Numerical approximation of biharmonic eigenvalue problems

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Abstract: This talk discusses the numerical approximation of biharmonic eigenvalue problems that arise in mechanics from the vibration or buckling of plates. Since classic conforming finite element methods are complicated to implement, this talk focuses on nonconforming methods. As one example the C^0 interior penalty method is considered. This method has the advantage that it uses standard Lagrange finite elements which are a common tool of finite element software libraries. The presence of re-entrant corners at the boundary of the domain leads to singularities in some eigenfunctions which are not well captured by uniform meshes. To circumvent any loss in convergence for non smooth eigenfunctions an adaptive finite element method (AFEM) is considered. For that a reliable and efficient a posteriori error estimator for both the energy error of the eigenfunctions as well as the eigenvalue error will be presented. Numerical examples show empirical optimal convergence of the proposed AFEM.