1105-65-1 **Susanne C Brenner*** (brenner@math.lsu.edu), Department of Mathematics, Center for Computation & Technology, Louisiana State University, Baton Rouge, LA 70803. *Novel Finite Element Methods for Optimal Control Problems with PDE Constraints.*

Let Ω be a bounded convex polygonal domain in $\mathbb{R}^2$. A model elliptic optimal control problem with pointwise state constraints is to find the minimizer of the functional

$$J(y,u) = \int_\Omega (y - y_d)^2\,dx + \beta \int_\Omega u^2\,dx,$$

where $(y,u) \in H_0^1(\Omega) \times L_2(\Omega)$ are subjected to the constraints

$$\begin{aligned} \int_\Omega \nabla y \cdot \nabla v\,dx = \int_\Omega uv\,dx \qquad & \forall\, v \in H_0^1(\Omega), \\ \psi_1 \le y \le \psi_2 \qquad & \text{a.e. in } \Omega. \end{aligned}$$

We will present finite element methods for this optimal control problem that are based on the reformulation of the problem as a fourth order elliptic variational inequality for y, discuss their *a priori* and *a posteriori* error analyses, and introduce post-processing procedures that generate approximations of the optimal control u from the approximations of the optimal state y.

This talk is based on joint work with C.B. Davis, J. Gedicke, L.-Y. Sung, H. Zhang and Y. Zhang. (Received September 22, 2014)