Seminar in Nonlinear Systems

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On a Class of Vector-valued Singular Perturbation Problems

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Abstract: Let W be a smooth function on $\mathbf{R}^2$ satisfying:

(i) $W > 0$ on $\mathbf{R}^2 \setminus \Gamma$, $W = 0$ on Γ, where Γ is a smooth closed curve in $\mathbf{R}^2$,

(ii) $W_{nn} > 0$ on Γ,

(iii) $\dfrac{\partial W}{\partial |z|} > 0$ for $|z| > R_0$.

We are interested in the asymptotic behavior, as $\epsilon \to 0$, of the minimizers $\{u_\epsilon\}$ for the minimization problem,

$$\min \int_G |\nabla u|^2 + \frac{1}{\epsilon^2} \int_G W(u), \quad \text{for } u \in H^1(G, \mathbf{R}^2) \text{ with } u = g \text{ on } \partial G,$$

where G is a bounded, smooth, simply connected domain of $\mathbf{R}^2$ and $g : \partial G \to \mathbf{R}^2$ is a smooth boundary data. An important special case is of $W(u) = (1 - |u|^2)^2$, which leads to a well-studied Ginzburg-Landau type energy. The new features here are that we allow a quite general class of potentials and we do not assume that g is Γ-valued. This is a joint work with Nelly André (Tours).

Refreshments provided