Title: Theory and applications of representing certain functionals with integrals, part VI

Abstract: We will complete our discussion of results from a paper by Buttazzo and Dal Maso. We will discuss the proof of the following:

**Theorem.** For every functional $F : W^{1,p} \times \mathcal{B} \rightarrow \mathbb{R}$, $1 \leq p \leq \infty$, the following conditions are equivalent:

1. there exists an integrand $f \in \text{Car}_p$, quasi-convex in $z$, such that
   
   $$F(u, B) = \int_B f(x, u(x), Du(x)) \, dx,$$

   for every $u \in W^{1,p}$ and every $B \in \mathcal{B}$,

2. $F$ is local on $\mathcal{A}$, is a measure, is $p$-bounded, satisfies the strong condition $(\omega)$, and for every $A \in \mathcal{A}$ the function $u \mapsto F(u, A)$ is sequentially lower semicontinuous on $W^{1,\infty}$ for the weak* convergence and lower semicontinuous on $W^{1,p}$ for the strong convergence,
3. \( F \) is local on \( \mathcal{B} \), is a measure, is \( p \)-bounded, satisfies the weak condition \((\omega)\), and for every \( A \in \mathcal{A} \) the function \( u \mapsto F(u, A) \) is sequentially lower semicontinuous on \( W^{1,\infty} \) for the weak* convergence.

Interested faculty and graduate students are encouraged to attend.