Constitutive upscaling of MR fluids GRIGOR NIKA, BOGDAN VERNESCU, Worcester Polytech Inst — We consider a suspension of solid magnetizable particles in a viscous fluid with an applied external magnetic field. We assume the fluid to be electrically non-conducting. Thus, we use the quasi-static Maxwell equations coupled with the Stokes equations to capture the magnetorheological effect. We upscale using two scale asymptotic expansions to obtain the effective equations consisting of a coupled nonlinear system in a connected phase domain as well as the new constitutive laws. Qualitative properties of the solution of this nonlinear system are studied.