Graduate School
of Production Engineering and Logistics

Guest Lecture
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On the Thermomechanics of Continuous Media with Diffusion and/or Weak Nonlocality

First the viewpoints on configurational forces of M.E.Gurtin and the author are contrasted. Then, working in parallel on the energy equation in a special form and the associated canonical equation of momentum, we focus attention on the case of deformable media which are priorilly finitely elastic, but they also admit the existence of thermodynamically irreversible phenomena by means of a diffusive internal variable of state , or alternately an additional degree of freedom, in any case presenting some weak nonlocality (gradient effects). Two descriptions follow thereof, one than can be called standard according to rational thermo-mechanics (there exists a generalized internal force or thermodynamically conjugated force for a variable and each of its gradient separately, and the entropy flux has its classical definition) or the so-called field-theoretic viewpoint in which only one generalized force (based on a variational derivative of the energy) is used. In the latter one, the entropy flux deviates form its classical definition but, simultaneously, by virtue of the space-time consistency, the Eshelby stress tensor has to be altered. Simple examples with diffusion of an internal variable illustrate these formulations that may be valuable in the description of some geomaterials.