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Title: Coupled universal relations in electro-magneto-elasticity

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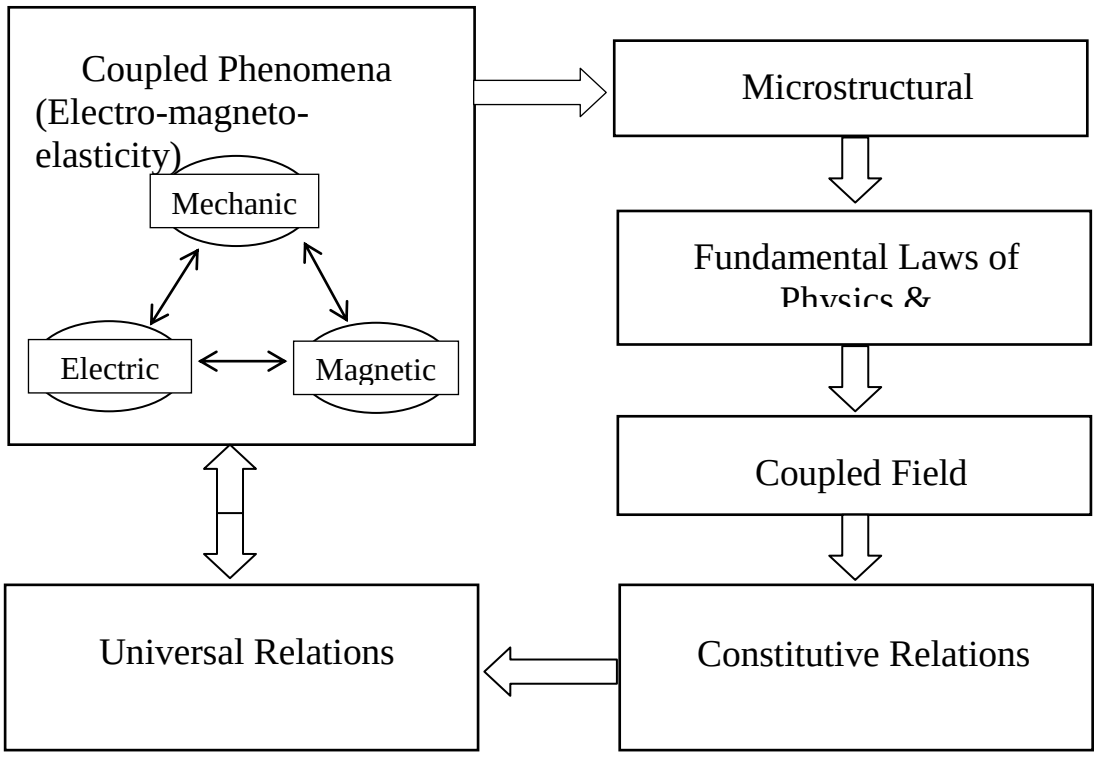
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Abstract

In the present work, we develop a class of the coupled universal relations with the possible forms of electro-magneto-elastic (EME) deformation families in smart materials. In line with that, we adopt a classical continuum mechanics-based approach following the second law of thermodynamics. More precisely, we first formulate the deformation of an EME continua through the fundamental laws of physics with an amended form of energy function. This amended energy function successfully resolves the physical interpretation of the Maxwell stress tensor under large deformations. Next, we develop the EME coupling type of universal relations through a new inequality for a class of an EME material parallel to an equation for a class of an elastic material existing in the literature. At last, we propose the possible

forms of EME deformation families in smart materials for some standard experimental arrangements. From the view point of the present study, we believe that we made an e_ort in line with the theoretical advancement of smart material deformations, which are under development in laboratories worldwide.



Recent Publications If any:

[1] Deepak Kumar and Somnath Sarangi. "Electro-magnetostriction under large deformation: modeling with experimental validation." *Mechanics of Materials* 128 (2019): 1-10.

[2] Deepak Kumar and Somnath Sarangi. "Instability analysis of an electro-magneto-elastic actuator: A continuum mechanics approach." *AIP Advances* 8.11 (2018): 115314.

Biography

Deepak Kumar is currently working as a Post-Doctoral Research Associate Fellow at SRIC-IIT Kharagpur, India. He has completed his PhD at the age of 27 years from Indian Institute of Technology Patna, India. In addition, he is an associate member (AMIE Fellow) of the Institution of Engineers India incorporated by Royal Charter 1935, a premier organization. He has published more than 19 papers in reputed journals and has been serving as a dedicated reserch member at SRIC-IIT Kgp LME Project. His current research areas include Continuum Mechanics, Applied Mathematics, Exergy Modeling, Smart Materials Modeling, EMR Fluids etc.

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