



SEMINAR

APPLIED MATHEMATICS AND MECHANICS

FS926

20 November 2017

A DCAMM seminar No. 716 will be presented by

Professor Nicholas Triantafyllidis
Aerospace Engineering Department & Mechanical Engineering Department,
The University of Michigan, Ann Arbor, MI 48109-2140, USA (emeritus)

The title of the lecture is

**The p-n junction under nonuniform strains:
General theory and application to photovoltaics**

Abstract:

Since the early days of semiconductors, it is known that mechanical strains influence their electronic behavior. Consequently, a consistent modeling of the coupling between mechanical, electric and electronic properties of these materials is essential in predicting the effects of mechanical loading on the overall electronic response of semiconductor devices.

To this end, we first develop a general fully-coupled mechanical, electrical and electronic continuum model of the finitely deformable semiconductor which accounts for the strain-dependence of the band edge energies, densities of states and electronic mobilities. Governing equations are derived from the appropriate conservation laws using the direct approach (control volume) of continuum thermodynamics. It is found that there exist electronic-induced strains that can be an order of magnitude more than the electromagnetic-induced (Maxwell) ones.

Next, motivated by photovoltaics applications involving bending, we use asymptotic methods in conjunction with the proposed general theory to compute current-voltage characteristic of a p-n junction subjected to non-uniform strains. It is found that for a typical mono-crystalline silicon solar cell, the dark current changes are rather significant, of the order of 20% for strains of 0.2%.

DATE:	Monday, 4 December 2017
TIME:	13:00 – 13:45 + questions
PLACE:	Room 013, Building 421, DTU, Technical University of Denmark

Danish pastry, coffee and tea will be served 15 minutes before the seminar starts.

All interested persons are invited.

Niels Leergaard Pedersen

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