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Seminar on higher-order theories of plates, shells and rods based on polynomial series expansion

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Date and Venue 14 December 2018, 10:00, Sala Ferrari, DIMEAS

The MUL^2 group in cooperation with AIDAA Torino and the FULLCOMP project is pleased to announce a seminar on higher-order theories of plates, shells and rods based on polynomial series expansion held by Professor Zozulya, currently a visiting Professor at DIMEAS.

Abstract

In this presentation will be considered new high order models of rods, plates and shells that are based on expansion of the main physical parameters in the polynomial series. We considered metaphysical models that consider micro structure of material and size dependent properties, which is very important at micro and nano scale. Proposed models are based on continuum theories and consider micropolar deformations, nonlocal effects and inhomogeneous properties of the materials.

Methodology consists in the following. First main tree dimensional field parameters, such as stress and strain tensors, vectors of displacements, temperature and electromagnetic characteristics of the material are expanded into Fourier series in terms of Legendre's polynomials with respect to a thickness coordinate. Thereby all the field equations are transformed to the corresponding equations for series coefficients. As result two-dimensional system of differential equations in term of main field parameters, boundary and initial conditions for the series coefficients has been obtained.

Higher order theories of micropolar beams, plates and shells have been developed using Carrera Unified Formulation. Navier's close form solutions have been obtained for simply supported micropolar beams, plates and shells. Some simple examples can be solved analytically, using standard mathematical tools. For more general cases finite element and boundary element approaches will be used.

Executive Summary of Dr. Zozulya

Education

- MsD in Civil Engineering, Kharkov State Technical University, Ukraine, Specialization: Structures, Bridges and Tunnels
- MsD in Mathematics, Kharkov State University, Ukraine, Specialization: Applied Mathematics. Numerical Methods
- PhD in Mechanical Engineering, Mechanical Engineering Institute of the Academy of Science of Ukraine, Specialization: Dynamic and Strength of Machines and Apparatus

- ScD in Mathematical Physics, Institute of Mechanics of the Academy of Science of Ukraine, Specialization: Solid Mechanics

Work experience

- 1978 - 1998 Structural Mechanics Department, Kharkov State Technical University, Ukraine. Researcher, Senior Researcher, Associate Professor, Professor, Head of Department.
- 1998 - Currently Research Center of the State Yucatan, Mexico, Materials Department. Professor, Investigador Titular C (Professor-Researcher)

Research Interest

- Theory of Plates and Shells
- Micro and Nano Mechanics
- Computer Simulation of MEMS/NEMS
- Fracture Mechanics
- FEM and BEM