

# MECHANICAL BEHAVIOR OF EXPONENTIAL FUNCTIONALLY GRADED SANDWICH PLATES UNDER BUCKLING LOAD AND RESTING ON ELASTIC FOUNDATION

Ahmed Draï<sup>1,2\*</sup>, Benaoumeur Aour<sup>2</sup>, Ahmed Amine Daikh<sup>3,4</sup>, Miloud Ladmek<sup>4</sup>,  
Abdelkader Belkacem<sup>4</sup>.

A. Draï<sup>1,2\*</sup>, B. Aour<sup>2</sup>, A. A. Daikh<sup>3,4</sup>, M. Ladmek<sup>4</sup>, A. Belkacem<sup>4</sup>.

<sup>1,2</sup> Mechanical engineering department, Faculty of sciences and technology, PO Box 305, Road of Mamounia, Mustapha STAMBOULI University of Mascara, 29000, Algeria.

<sup>2</sup> Laboratory of Applied Biomechanics And Biomaterials (LABAB), National Polytechnic School of Oran (ENPO), BP 1523 El Mnaour, Oran, 31000, Algeria.

<sup>3</sup> Departement of technology, university center of Naama, Naama, 45000, Algeria.

<sup>4</sup> Department of Civil Engineering, Laboratoire d'Etude des Structures et de Mécanique des Matériaux, Mascara, Algeria

\* Email address of the presenting author: [draiahmed14@yahoo.fr](mailto:draiahmed14@yahoo.fr)

## Abstract

Mechanical buckling of functionally graded (FGM) sandwich plates is analyzed in this research using new higher-order shear deformation plate theory which captures the shear deformation influences needless of any shear correction factor. New functionally graded sandwich structure based on variable exponential function is presented in this analysis. Material properties of functionally graded face layers are assumed to vary continuously through-the-thickness according to an exponential function in terms of the volume fractions of the constituents (E-FGM), while the core layer is made of ceramic. Equilibrium and stability equations of E-FGM sandwich plate with simply supported boundary conditions are derived using the generalized higher-order shear deformation plate theory and the Hamilton's variational principle, and solved by using the Navier's solutions. Several numerical results indicate the influence of the plate aspect ratio, the relative thickness, the gradient index and the sandwich scheme on the critical buckling load of FGM sandwich plates are investigated.

**Keywords:** Mechanical buckling; E-FGM sandwich plate; higher-order shear deformation theory.

## Acknowledgements

I would like to express my special thanks of gratitude to my friend Ahmed Amine DAIKH as well as our principal who gave me the golden opportunity to do this wonderful project, which also helped me in doing a lot of Research and i came to know about so many new things. I am really thankful to them.