



**International Conference on Mathematics and Mechanics (ICMM-2024)**  
**5<sup>th</sup> - 6<sup>th</sup> July 2024**  
**Vancouver, Canada**

**Invited Speaker: Dr. Majid Afzali**

**Title: Hygro-thermal buckling analysis of FG plate using CUF**



**Author Name with affiliation:** **Majid Afzali**, *Department of Mechanical and Aerospace Engineering, Politecnico di Torino, Turin, Italy*

**Co-author Name with affiliation:** **Sajedeh Khosravani**, *Department of Mechanical and Aerospace Engineering, Politecnico di Torino, Turin, Italy*

**Co-author Name with affiliation:** **Erasmus Carrera**, *Department of Mechanical and Aerospace Engineering, Politecnico di Torino, Turin, Italy*

**University:** Politecnico di Torino, Turin, Italy

**Abstract:**

This article investigates the hygro-thermal buckling of the FG plate. One side of the plate is rich ceramic and the other side is fully metal. The properties between the two sides are a combination of both materials and are gradually changed through the thickness direction. Since the FG plate is created from a hybrid of ceramic and metal, it makes a balance between the thermal and mechanical properties. The low thermal conductivity and high thermal strength of ceramics and the great strength of metals are consequential properties of these materials. The moisture concentration and temperature distribution can be considered uniform or non-uniform. The governing equations are achieved by employing the virtual work principle. Here, FEM based on a higher-order plate theory called Carrera Unified Formulation (CUF), is used to obtain the critical buckling load under thermo-humidity conditions. Also, the effects of some parameters, like geometry aspect ratio, volume fraction index, and the order of expansion functions of the plate on the hygro-thermal buckling load, have been examined.



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**Keywords:** FG plate, Hygro-thermal buckling load, CUF, Expansion function, ceramic, metal

**Biography:** Majid Afzali graduated in mechanical engineering in 2014 at Science and Research University, Tehran, Iran. He earned his Master's degree in Aerospace Engineering - Structural Design at K. N. Toosi University of Technology, Tehran, Iran, in 2017. His master's thesis title was: "Buckling Analysis of Composite Sandwich Panel based on the Generalized Unified Formulation Using Layerwise Theory". His master's thesis was selected as the best-nominated thesis by the Iranian Aerospace Association. Then, he successfully completed his Ph.D. in Mechanical Engineering at Politecnico di Torino, Italy. His doctoral dissertation title was: "Nonlinear numerical analysis of thermal post-buckling of rectangular FGM plates with temperature-dependent properties using CUF". His main research fields are computational mechanics, composite and smart materials (FGM), nonlinear FEM, structural analysis, stability of structures, fracture mechanics, and optimization methods. He has been a teaching assistant at the K.N.Toosi University of Technology for Structural Analysis, Optimization Methods, Dynamics, and Mechanical Vibration. He is the author and co-author of several high-quality journal papers. He serves as a peer reviewer of some international journals. He also worked as a virtual structural analyst in the R&D department of IVECO GROUP Company in Turin, Italy, from 2022 to 2023.



# CERTIFICATE OF PRESENTATION



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This is to certify that.....**Majid Afzali**.....affiliated with

Politecnico di Torino, Turin, Italy

.....has presented a paper titled

Hygro-thermal buckling analysis of FG plate using CUF

at the conference organized by the Research Fora (RF) held on 5th - 6th July 2024 at Vancouver, Canada.



**Dr. Amar Singh**  
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This is to certify that.....**Sajedeh Khosravani**.....affiliated with

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