

## Electrical Equivalent Analysis of Micro Cantilever Beams for Sensing Applications

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**Abstract :** Microcantilevers are the basic MEMS devices, which can be used as sensors, actuators, and electronics can be easily built into them. The detection principle of microcantilever sensors is based on the measurement of change in cantilever deflection or change in its resonance frequency. The objective of this work is to explore the analogies between the mechanical and electrical equivalent of microcantilever beams. Normally scientists and engineers working in MEMS use expensive software like CoventorWare, IntelliSuite, ANSYS/Multiphysics, etc. This paper indicates the need of developing the electrical equivalent of the MEMS structure and with that, one can have a better insight on important parameters, and their interrelation of the MEMS structure. In this work, considering the mechanical model of the microcantilever, the equivalent electrical circuit is drawn and using a force-voltage analogy, it is analyzed with circuit simulation software. By doing so, one can gain access to a powerful set of intellectual tools that have been developed for understanding electrical circuits. Later the analysis is performed using ANSYS/Multiphysics - software based on finite element method (FEM). It is observed that both mechanical and electrical domain results for a rectangular microcantilevers are in agreement with each other.

**Keywords :** electrical equivalent circuit analogy, FEM analysis, micro cantilevers, micro sensors

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