Title: FINITE ELEMENT ANALYSIS OF A PIEZO COUPLED CANTILEVER BEAM ENERGY HARVESTER

Ref: VIBHAR3

Type: Individual

Vacancy: 1 student

Duration: 1 semester

Project Description:

Small scale energy harvesting devices become widespread with the contemporary use of power efficient circuitry, such as the ones used for wireless sensor networks. One of the basic structure in order absorb energy from ambient vibration is a cantilever beam that vibrates at fundamental natural frequency. The objective of this project is to make the finite element analysis of an Aluminium cantilever beam with an MFC (Macro-fiber composite) piezoelectric patch. As a result of the FEA, the first mode natural frequency of the beam and the open circuit voltage induced on the piezoelectric patch is going to be determined.

Work Description:

1. Literature survey on modal analysis and piezoelectric modelling in ANSYS
2. Create a 3-D cantilever beam model.
3. From the 3-D model, create a finite element (FE) mesh in ANSYS.
4. Using FE mesh, material properties, and boundary conditions, obtain solution for modal analysis and open circuit voltage.
5. Evaluate the natural frequency and open circuit voltage of the cantilever beam given input harmonic vibration properties.

Qualification and Skills:

1. Interest and background in Finite Element Analysis tools (preferably ANSYS).
2. Basic knowledge of mechanical vibrations, modal analysis and natural frequencies.