

# Sensitivity Analysis in Structural Dynamics using the ZFEM Complex Variable Finite Element Method

## A. Goals:

Investigate potential applications of ZFEM within structural dynamic problems

## B. Brief Description:

Sensitivity analysis of structural systems is of great importance for structural dynamic modifications. The present research demonstrates how to accurately and efficiently obtain derivatives of linear dynamic systems using the complex step method and the generalized multicomplex step method implemented within a complex variable finite element method (ZFEM). An undamped and damped simply supported beam was modeled using ZFEM and the response derivatives were computed with respect to load amplitude, load frequency, beam cross sectional dimension, and Rayleigh damping coefficients.

## C. Heights of Achievements this semester:

- Implemented ZFEM on a linear dynamic problem

- First-order and second-order derivatives of deflection with respect to the Rayleigh damping mass proportional coefficient,  $\sigma$ , using ZFEM (multicomplex-step method)

