

# FE Structural Dynamics with Laminated Composite Materials

## Task

- Get familiar with Equivalent Single Layer (ESL) theory for modelling composite laminates.
- Implement the Classical Plate Theory (CLPT) and the First-Order Shear Deformation Plate Theory (FSDT) formulations for a Finite Element shell element.
- Perform modal analysis in planar structures discretized with the derived element.
- Validate the modal analysis results against a commercial software reference.

### Project Characteristics

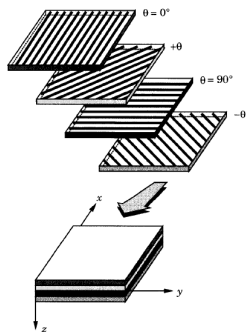
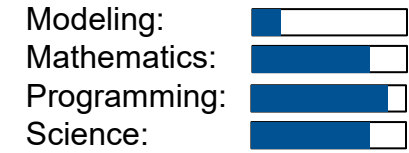


Figure 1 - A laminate made up of unidirectional laminae with different fibre orientations [1].

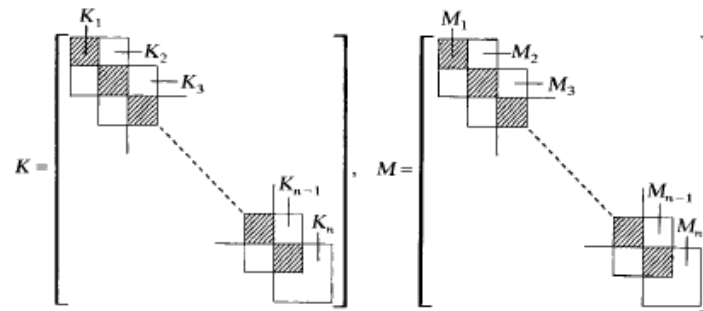


Figure 2 - Finite Element global matrices assembly [3].

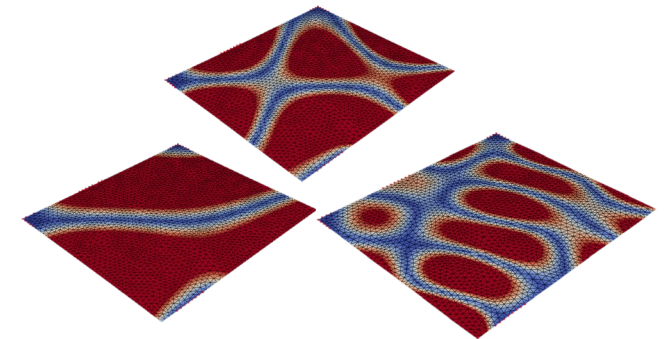


Figure 3 – Modal shapes solution.

[1] Reddy, J.N., 2003. Mechanics of laminated composite plates and shells: theory and analysis. CRC press.

[2] Petyt, M., 2010. Introduction to finite element vibration analysis. Cambridge university press.

[3] Meirovitch, L., 1980. Computational methods in structural dynamics (Vol. 5). Springer Science & Business Media.