

# NEiNastran

## Module NE-L2 (Normal Modes, Buckling, and Prestress)

### Overview

This package expands on the capabilities of the basic NE-L1 package with the addition of the buckling, modal, and prestress solution types. As with NE-L1 all material models including composites and element types including 6 DOF/Node CQUADR and CTRIAR and parabolic solid elements are supported.

### Capabilities:

#### Linear Buckling Analysis:

- Critical Buckling Loads and Mode Shapes
- Linear and nonlinear initial stress (requires NE-L4)
- Extremely fast blocked Lanczos and subspace methods
- Solid elements can be used as thin plates with no loss in accuracy

#### Normal Modes Analysis:

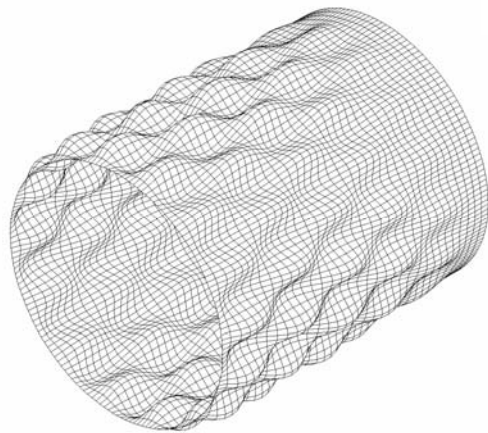
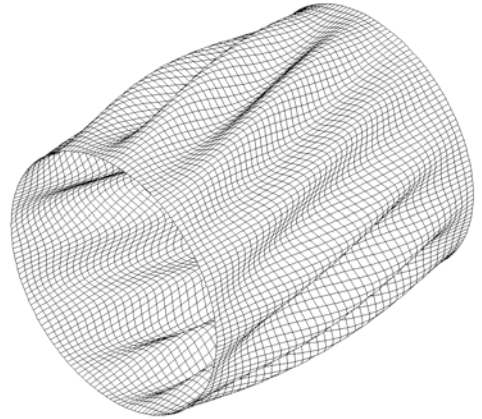
- Natural Frequencies and Mode Shapes
- Flexible and Rigid Body Motion
- Modal Participation Factors
- Modal Effective Mass/Weight (actual values plus percent of total mass, including rotational terms)
- Modal Reaction Forces
- Grid point based eigenvector normalization
- Automated numerical damping
- Iterative mode for Lanczos eigensolver can efficiently handle huge parabolic solid models over 3 million DOF

#### Prestress Analysis Options are Available for Each Dynamic Solution:

- Linear Prestress
- Nonlinear Prestress (requires NE-L4)

#### Direct Matrix Input Grid (DMIG) Support:

- Stiffness matrix import and export
- Mass matrix import and export



#### Model Reduction:

- Craig-Bampton Reduction (Component Modes Synthesis)
- Static condensation
- Guyan Reduction
- Export reduced mass, stiffness, damping, and load matrixes to DMIG or NASTRAN Output 2 (.OP2)
- Residual vectors for improved accuracy
- Automated model reduction tools
- Automated internal superelement generation (Craig-Bampton CMS)

**Modal Database:**

- Allows reuse of Modal Data for further modal response analysis – Frequency response or transient response
- Allows multiple data recovery runs in modal response analysis for maximum results storage efficiency

**Modal Set:**

- Selective mode usage for modal response analysis using
  - Set of mode numbers
  - Top effective mass count
  - Effective mass threshold

**Modal Correlation:**

- Modal Assurance Criterion (MAC) output and 3D plots
- Modal Cross-Orthogonality output and 3D plots
- MS Excel Comma Separated Variable (.CSV) and NEiNastran Modal Database (.MDB) input formats
- Automatic interpolation of input data to closest grid

**Efficient Solution of Large Models:**

- Sparse direct and iterative matrix solvers to handle very large models with minimal processing time
- Parallel processing and I/O for faster performance
- Model reduction methods

**Visualization in the Editor**

- View extracted frequency and modal effective mass versus mode number
- View 3D MAC plots

**Global Matrix Output:**

- Linear stiffness matrix
- Differential stiffness matrix
- Mass matrix

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**NEiNastran for Windows**  
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