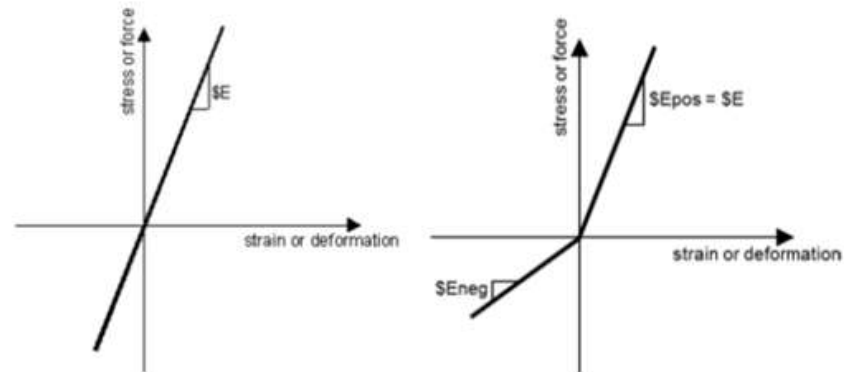
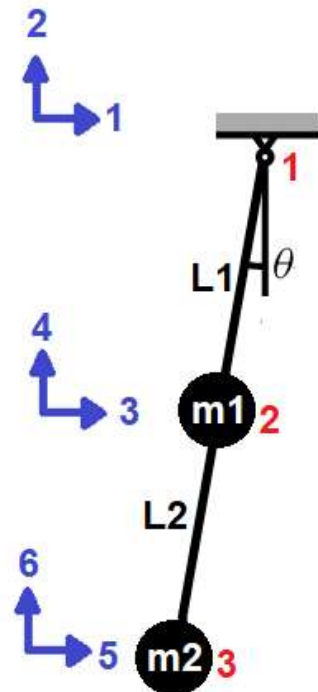


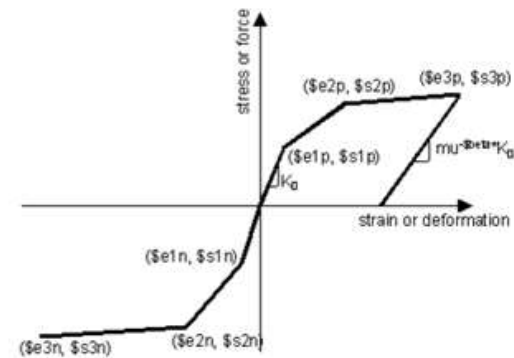
>> IN THE NAME OF ALLAH, THE MOST GRACIOUS, THE MOST MERCIFUL <<

MODELING OF 2D DOUBLE PENDULUM MDOF STRUCTURE USING OPENSEES

THIS PROGRAM WRITTEN BY MICHAEL H. SCOTT AND MODIFIED BY SALAR DELAVAR GHASHGHAEE (QASHQAI)



TRUSS ELEMENT ELASTIC MATERIAL



TRUSS ELEMENT INELASTIC MATERIAL

Spyder (Python 3.12)

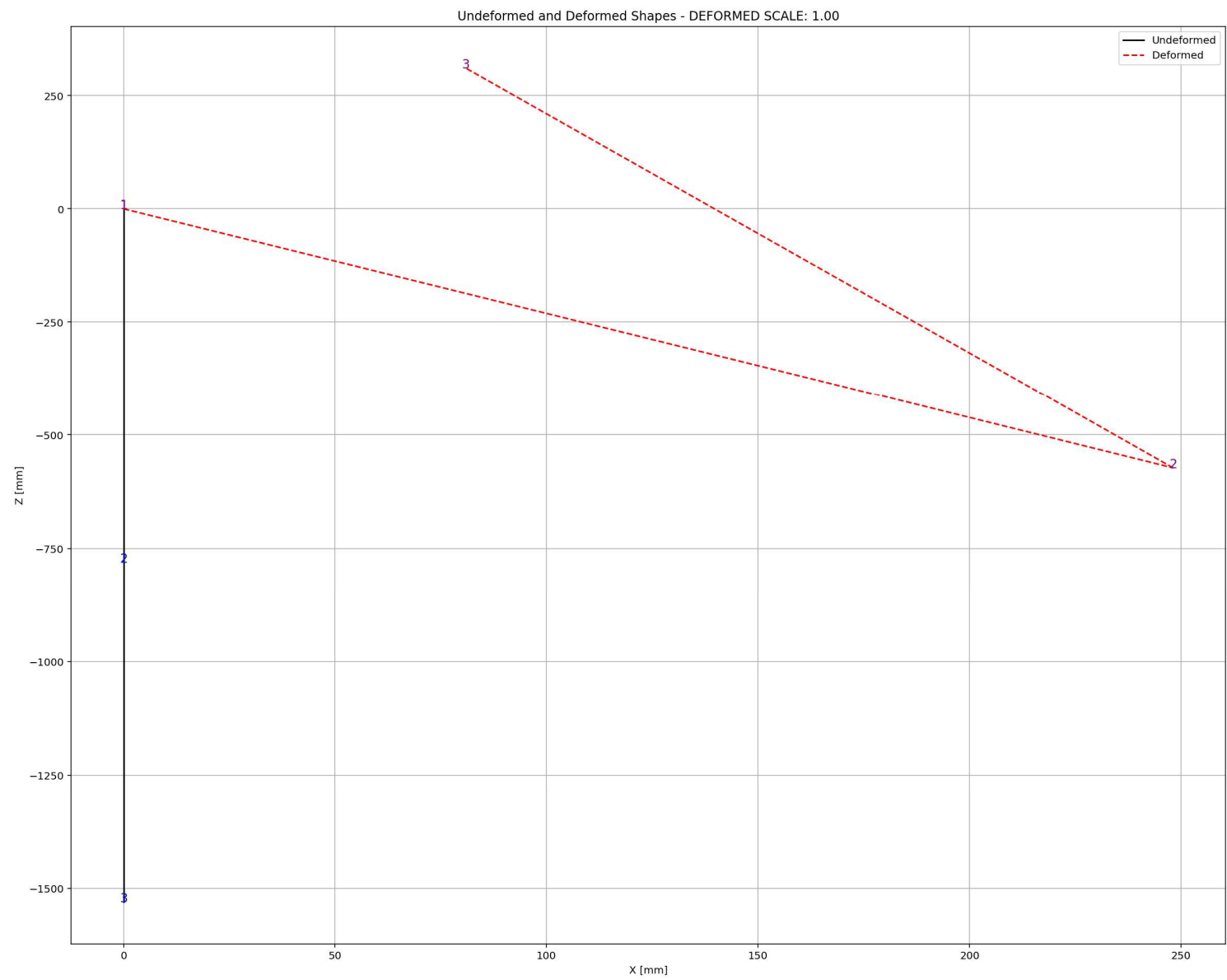
File Edit Search Source Run Debug Consoles Projects Tools View Help

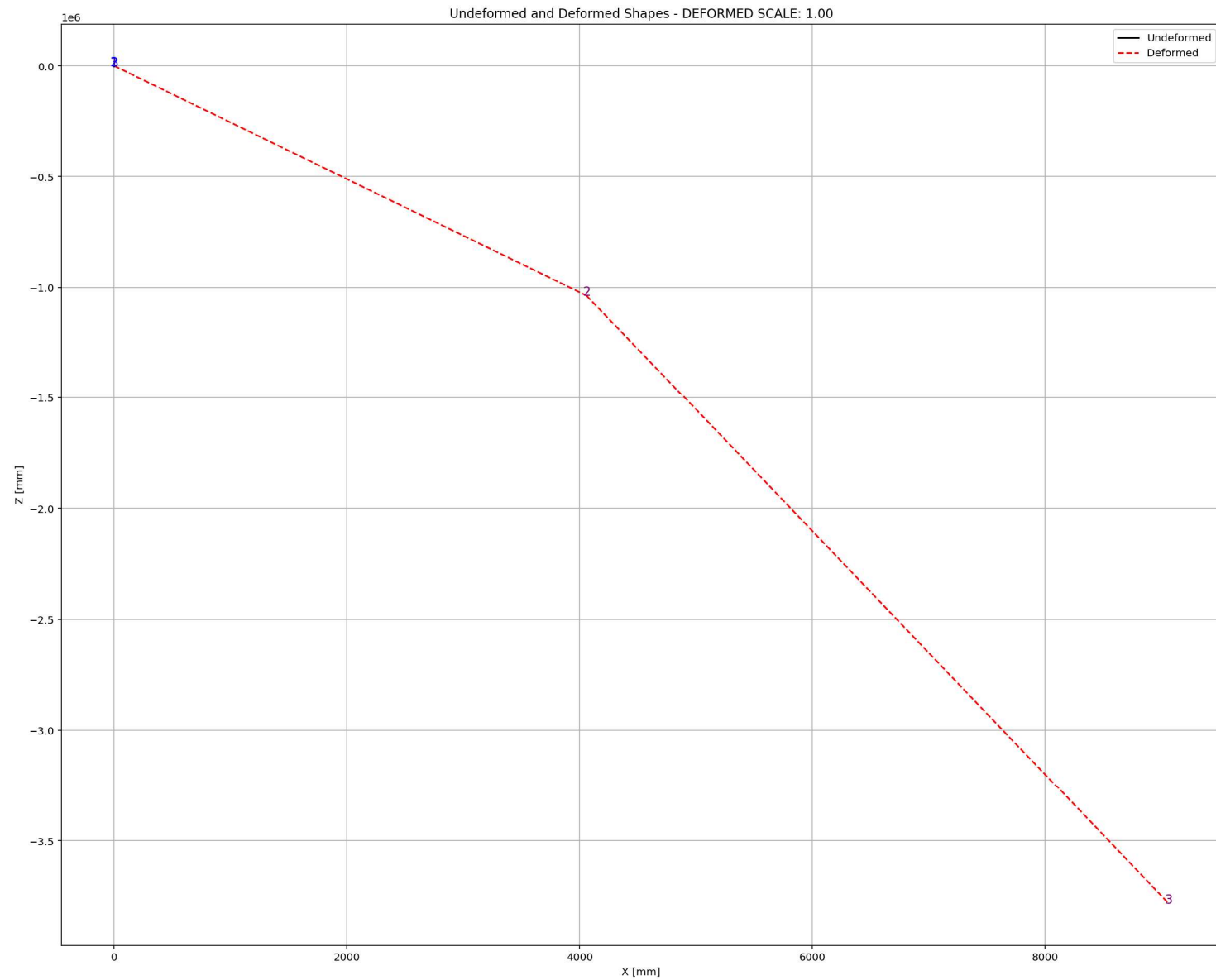
C:\Users\ DELL\Desktop\OPENSEES_FILES\PENDULUM\EXAMPLE_03

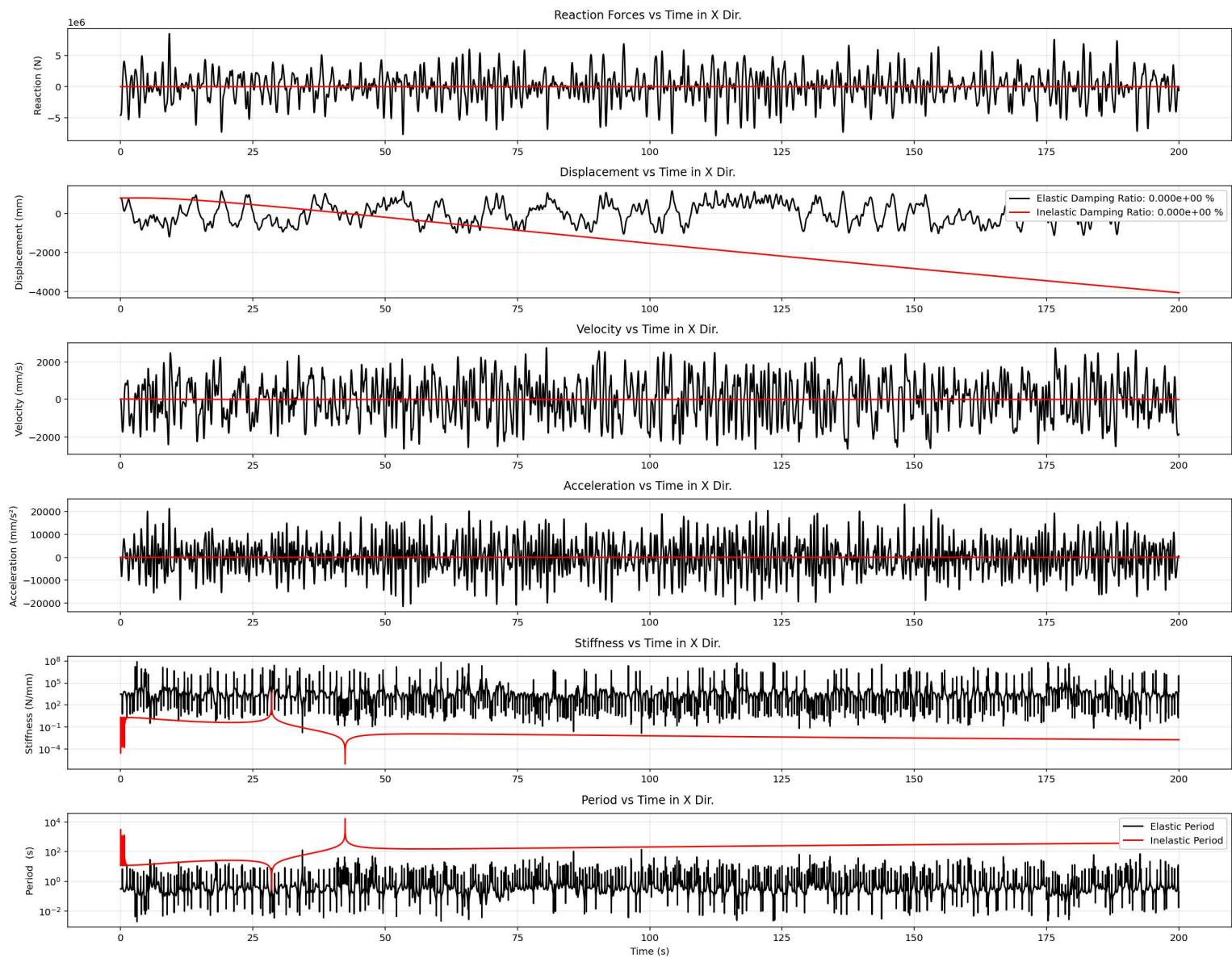
PENDULUM_THREE.py

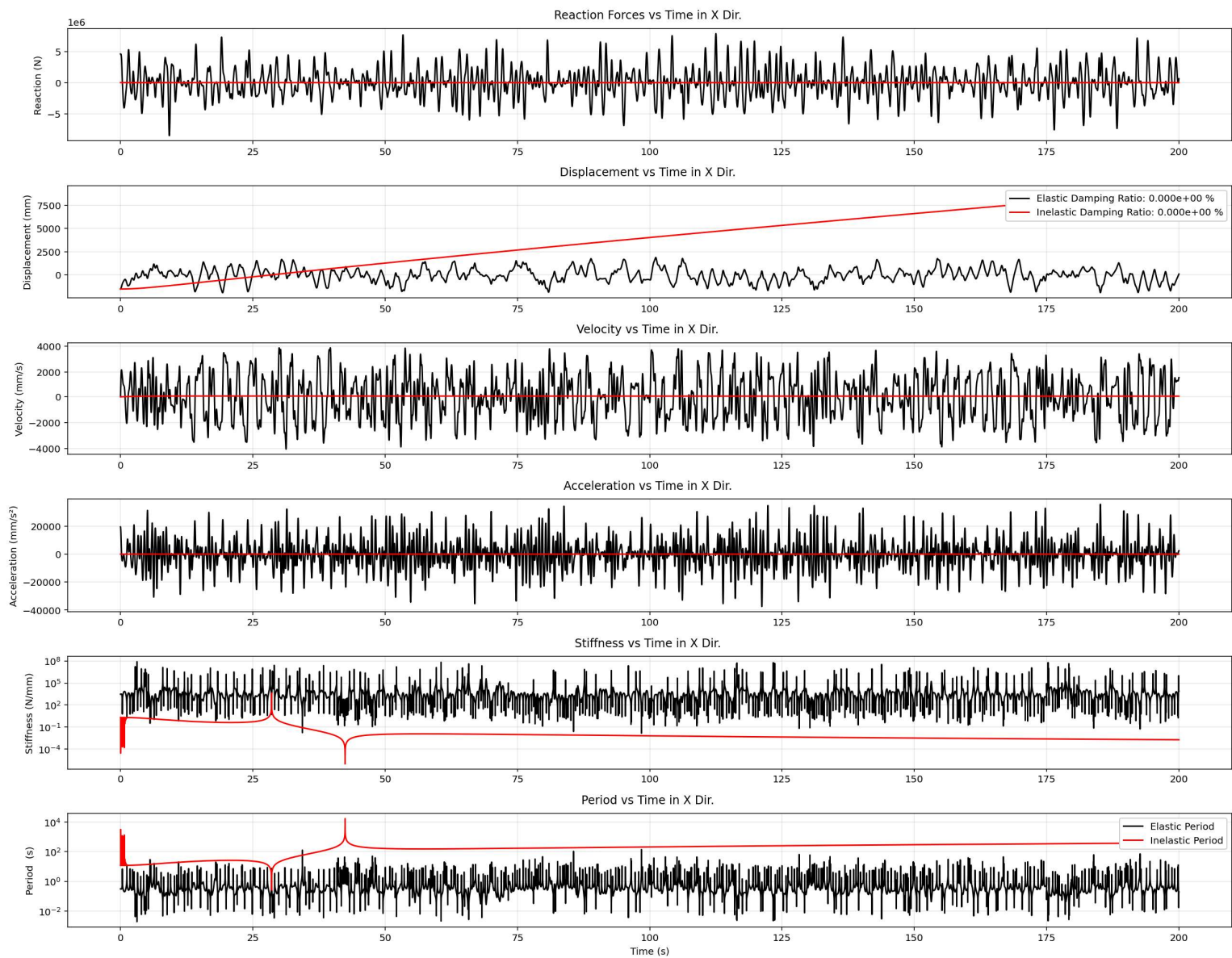
```
1 #####
2 # >> IN THE NAME OF ALLAH, THE MOST GRACIOUS, THE MOST MERCIFUL <<
3 # MODELING OF 2D DOUBLE PENDULUM MDOF STRUCTURE USING OPENSEES
4 # -----
5 # EVALUATION OF DAMPING FORCE (FD), SPRING FORCE (FS) AND INERTIA FORCE (
6 # -----
7 # THIS PROGRAM WRITTEN BY MICHAEL H. SCOTT AND MODIFIED BY SALAR DELAVAR GHASHGHAEI
8 # EMAIL: salar.d.ghashghaei@gmail.com
9 #####
10 """
11 This code performs nonlinear time history analysis of a 2D double pendulum
12 (truss elements) under harmonic base excitation, comparing elastic vs inelastic
13 material behavior. It computes dynamic responses (displacement, velocity, acceleration, re
14 at each node, extracts time-varying period and stiffness degradation, and calculates
15 damping ratios from response histories. The analysis uses corotational truss elements
16 with either Elastic or Hysteretic (steel) material models, Newmark integration, and
17 accounts for gravity loads and initial geometric imperfections.
18 Key outputs include force-displacement hysteresis, damping force-velocity relationships,
19 and period elongation due to inelastic action - essential for understanding seismic
20 performance and energy dissipation in nonlinear structures.
21 Very helpful Website for better learning:
22 https://portwooddigital.com/2025/09/08/double-inverted-pendulum/
23 """
24 #%%-----
25 # YOUTUBE: Simple Pendulum
26 'https://www.youtube.com/watch?v=fnvGVsxPuLs'
27 # YOUTUBE: Everything You Need To Know About Pendulums: Physics Help Room
28 'https://www.youtube.com/watch?v=0q0L7Fj4dk8'
29 # YOUTUBE: How a Giant Pendulum Made Taipei101 Possible
30 'https://www.youtube.com/watch?v=mGe9zjwK2gQ'
31 # BOOK: Differential Equations for Engineers - Wei-Chau Xie - CAMBRIDGE
32 'https://www.cambridge.org/core/books/differential-equations-for-engineers/1B8F1A62BF6F98EB
33 #%%-----
34 import openseespy.opensees as ops
```

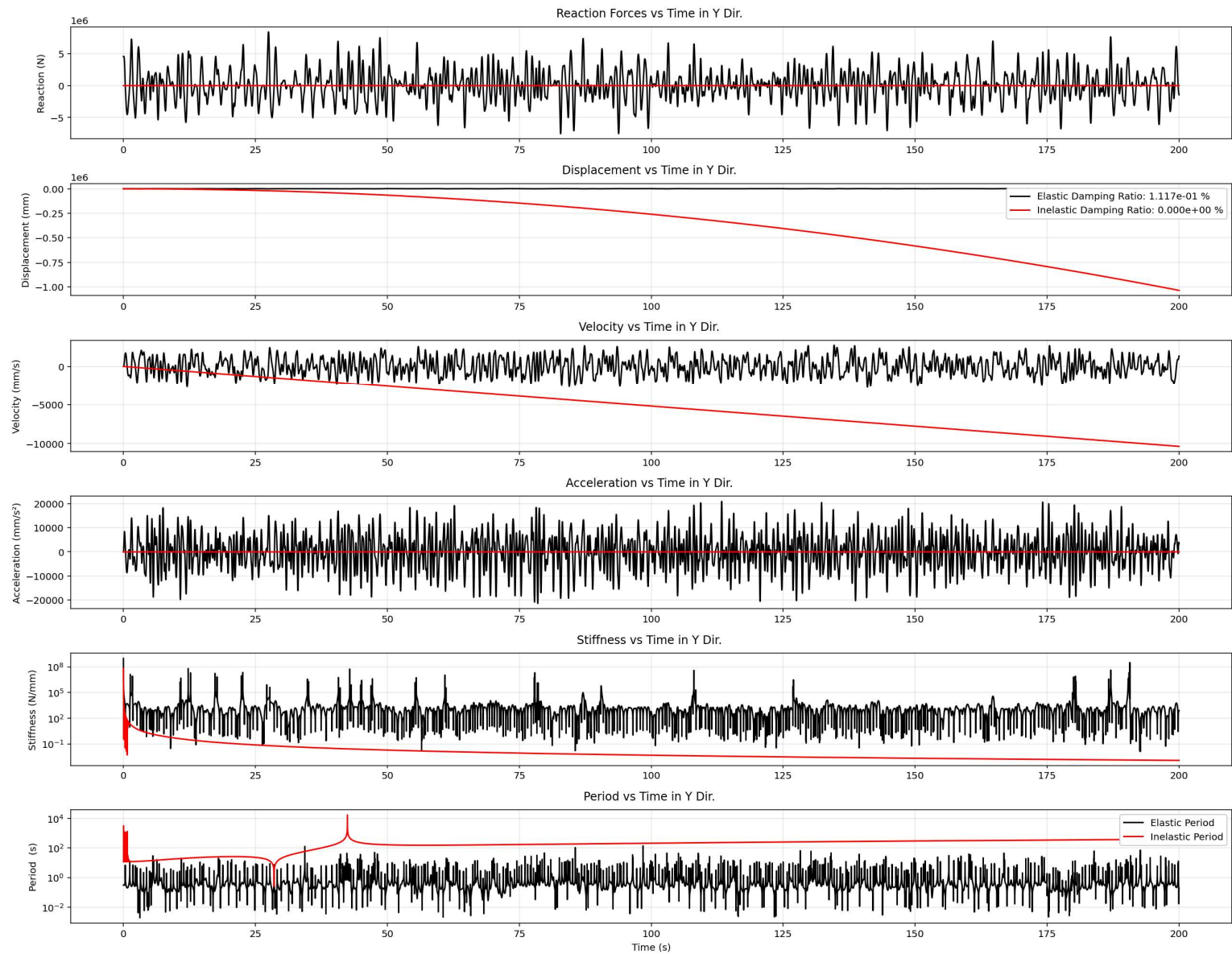
Damping Force (FD) vs Velocity Curve

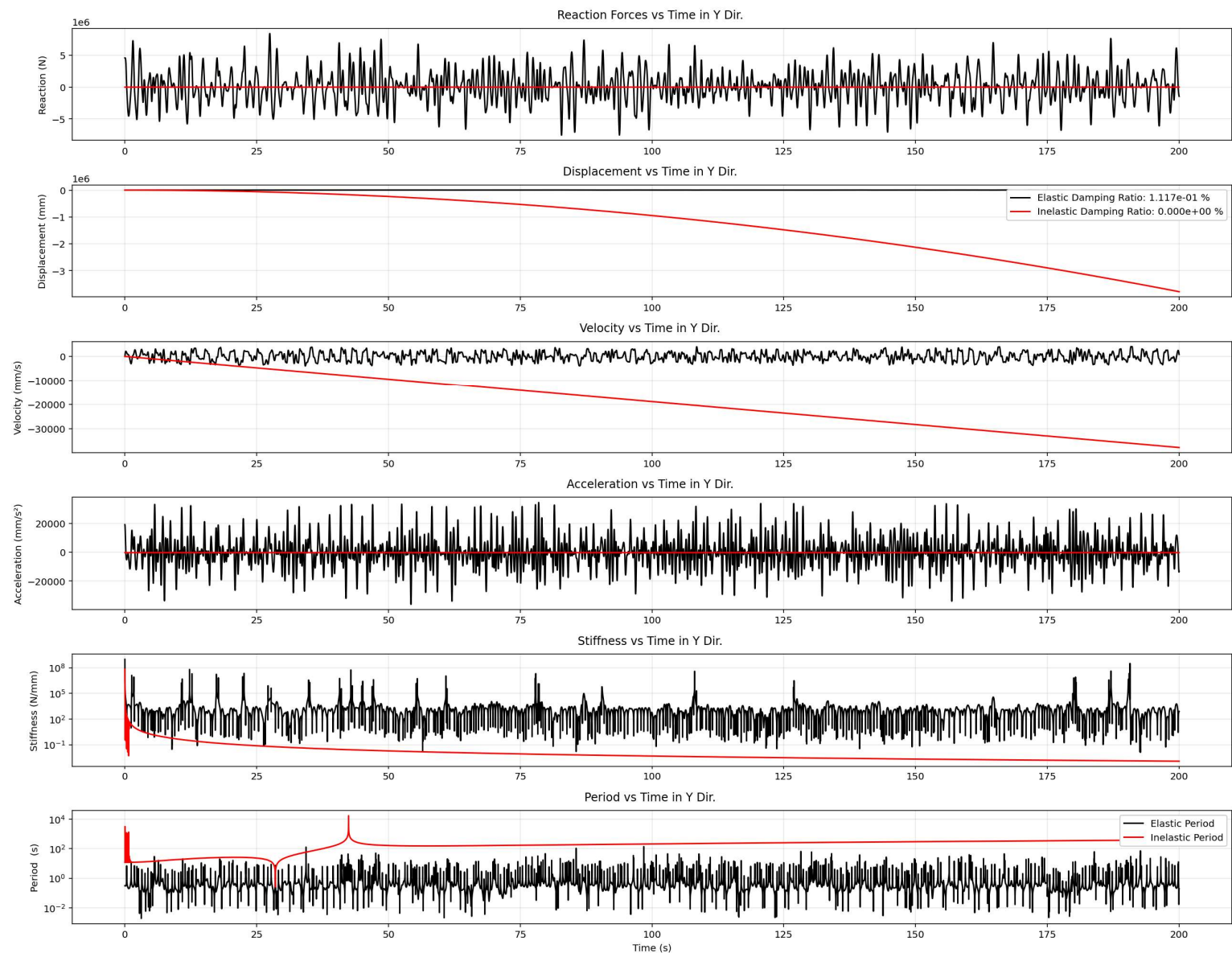


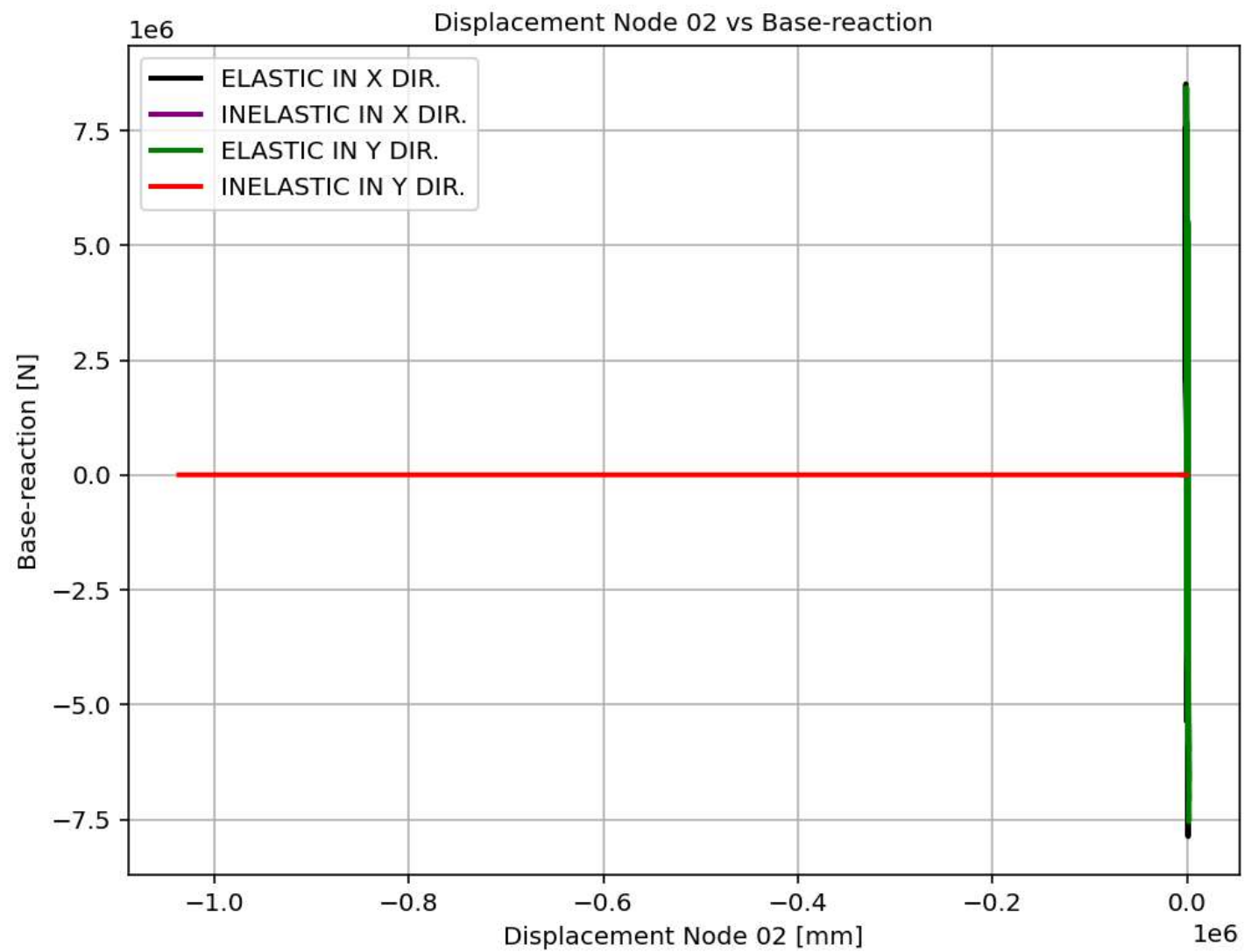


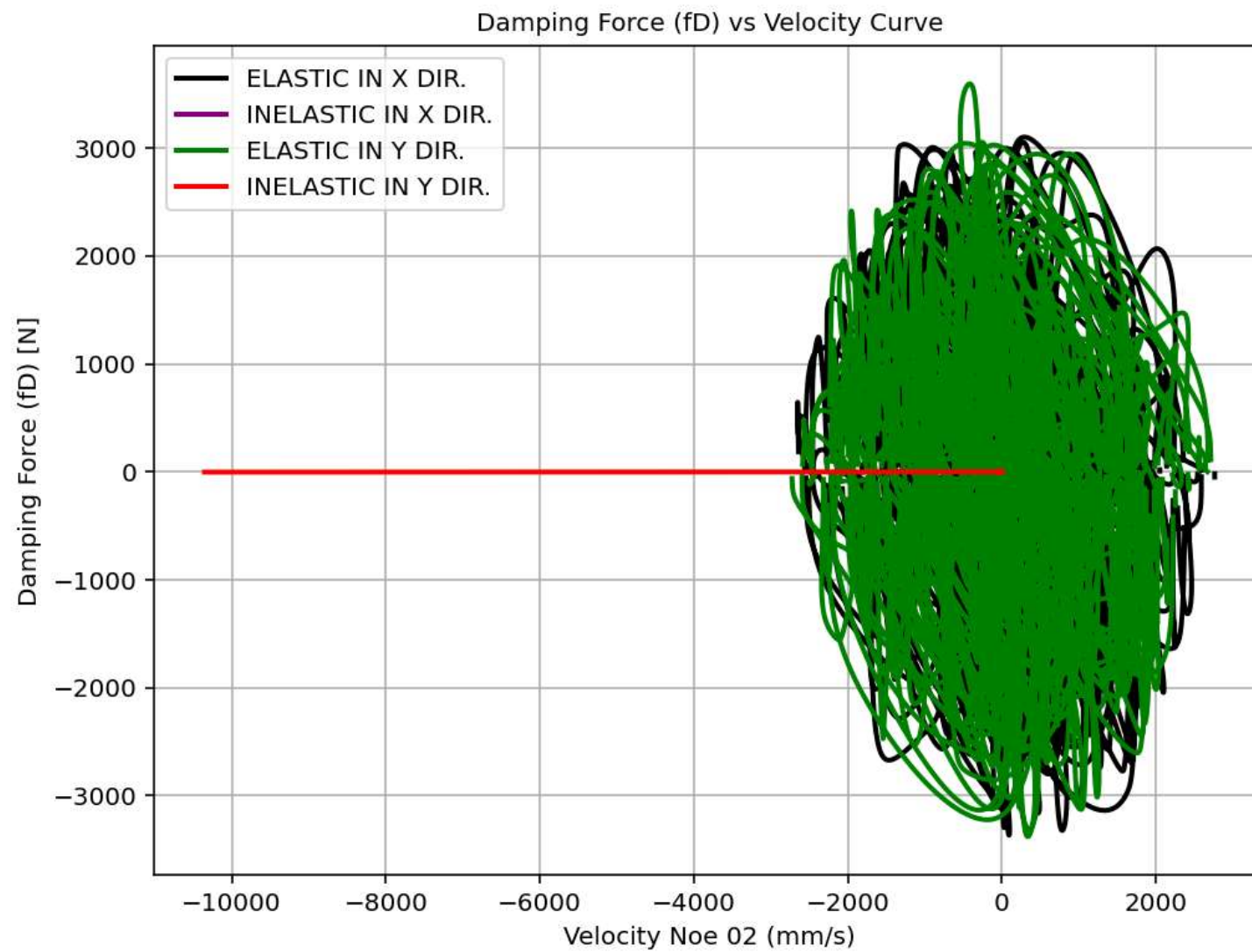


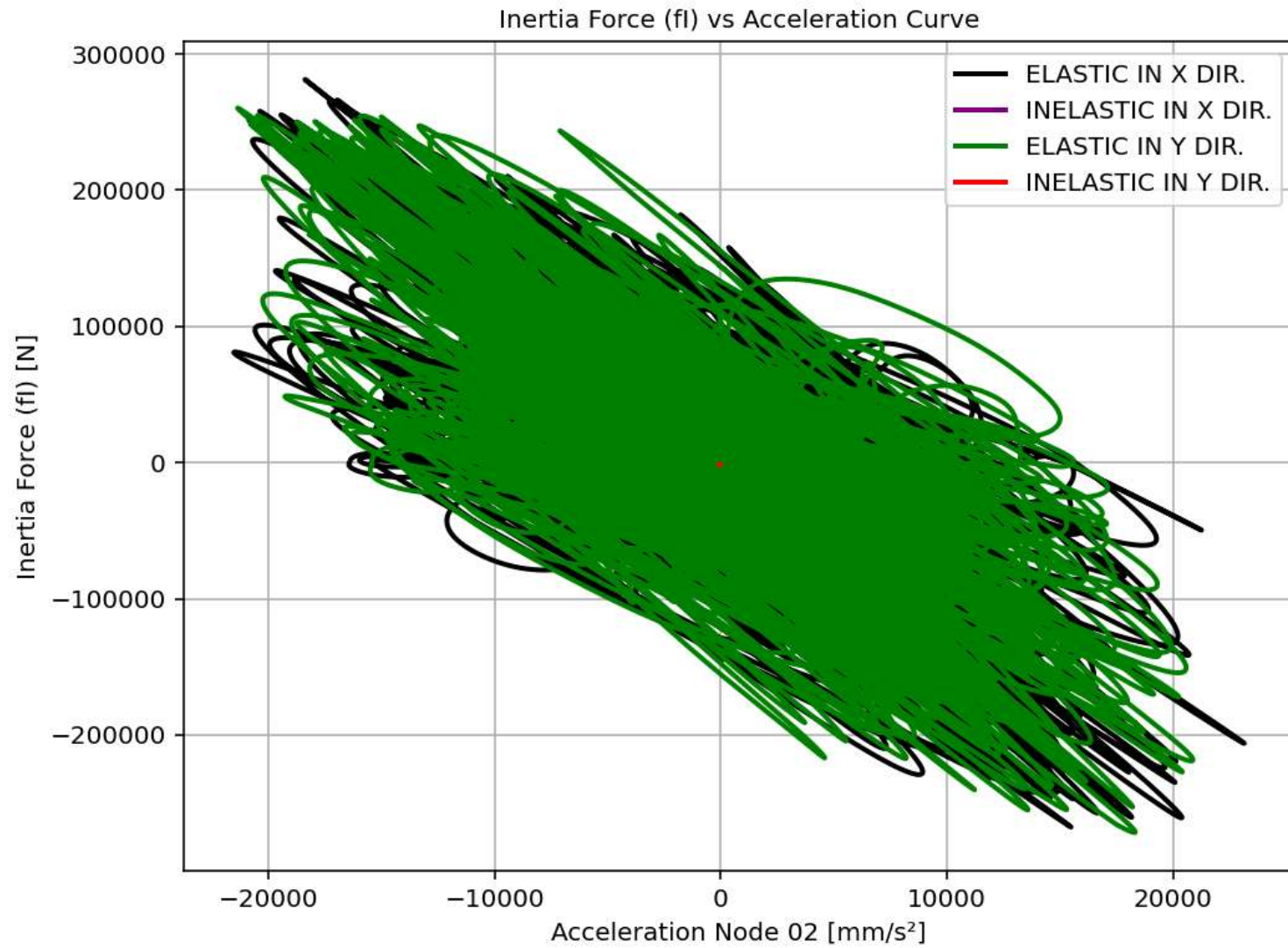


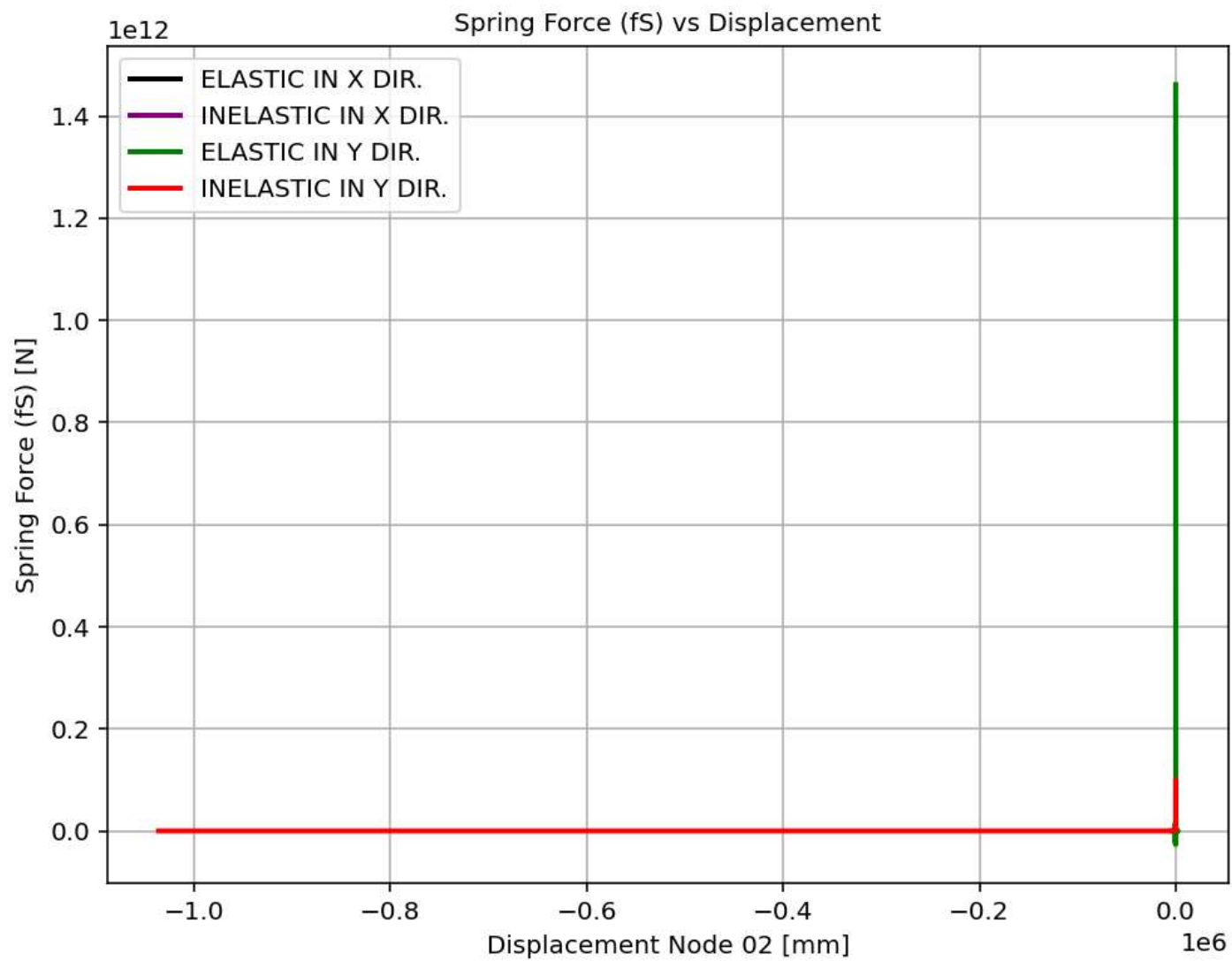












Damping Force (fD) vs Displacement Curve

