Help for writing your own code

To help you write the code from scratch, you can find the code for a similar exercise at the following url

https://github.com/a-brugnoli/fea-class/tree/main/PC1/truss_example_1
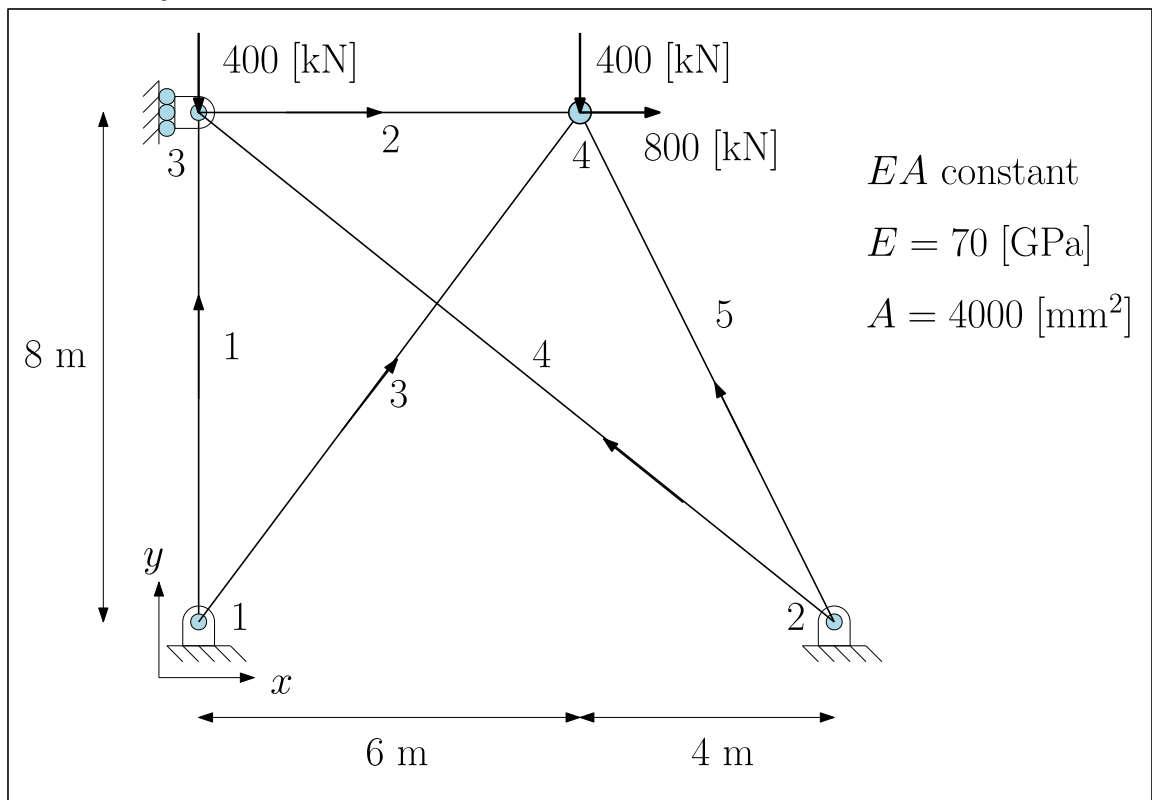
In particular the useful functions are found at this link:

https://github.com/a-brugnoli/fea-class/tree/main/src/fem/

You can copy the necessary functions from there.

Analysis of a 2D hyperstatic truss problem

The following example is Example 3.9 at page 114 from *Kassimali, A. (2012). Matrix analysis of structures (Vol. 2).*

The bars number 3 and 4 do not actally cross each other. Find the displacements of the nodes, the reaction forces and the member axial forces.

You can then solve the the same problem but with a different loading condition.
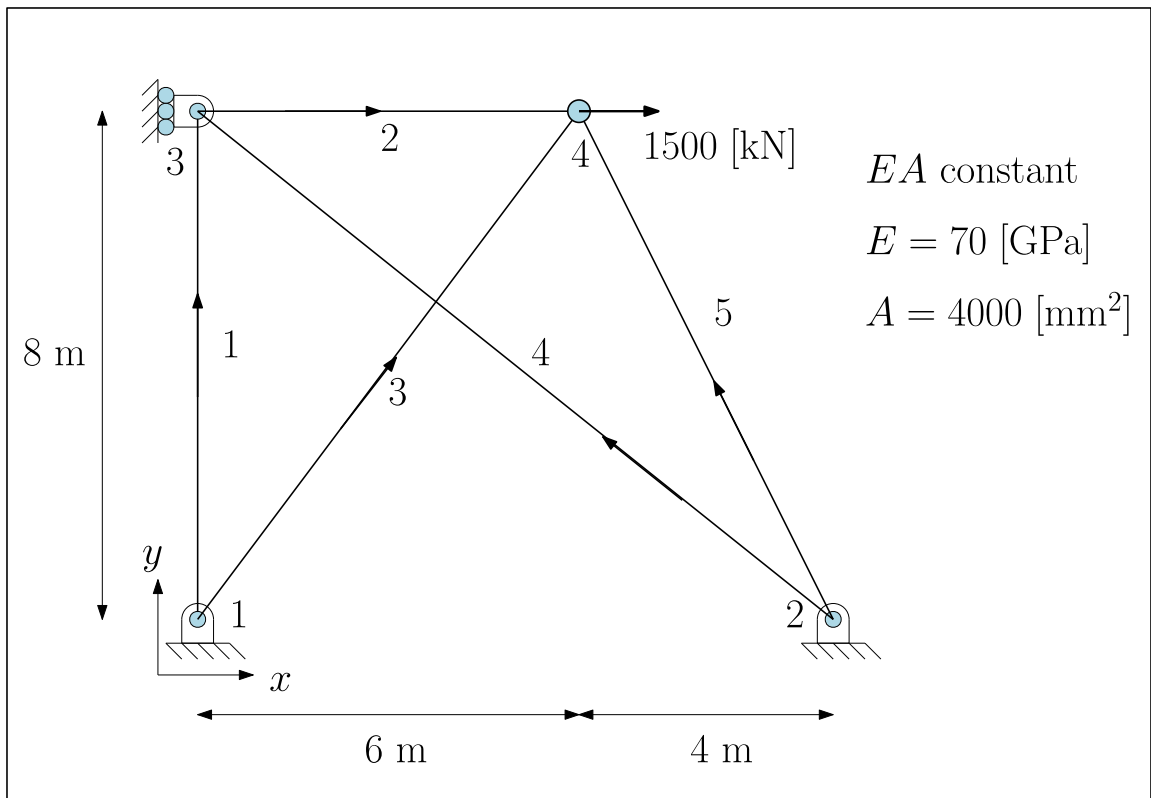
Since the structure is the same (same geometry, material and boundary conditions), the stiffness matrix is the same.

To go further

The material used (Aluminium) has a yield strength of   . Given a safety factor of 2, the maxixum stress accettable in the structure is

               −   . Optimize the truss section so that the maximum stress in the structure is attained but not exceeded. Use the first load case for this study.