5. Elastic thread *(10 points)* Equipment: ruler, tape, an elastic thread, a wooden rod, marker, a known weight.

The purpose of this problem is to study the elastic properties of an elastic thread for large relative deformations $\varepsilon = (l - l_0)/l_0$, where l_0 and l are the lengths in initial and stretched states, respectively. If the Hook's law were valid, the ratio F/ε of the elastic force F and ε would be constant: $F/\varepsilon = SE$, where S is the cross-section area of the thread and E — the Young modulus of the thread material.

i) Collect the data needed to plot the ratio F/ε as a function ε, up to $\varepsilon \approx 4$. Plot the appropriate graph, and indicate the uncertainties.

ii) By making assumption that the Young modulus $E = F/S\varepsilon$ remains constant, study, how does the volume of the thread depend on ε. Plot the appropriate graph.