4th Laboratory exercise

Elasticity- Hooke's Law of elasticity

Theoretical part

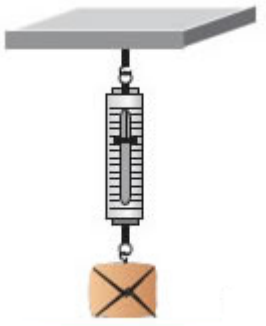
The various materials can be separated in elastics and plastics. When a certain force acts on a body, the body is deformed. If it takes its original form as soon as the power ceases, we call the body elastic. For example, a steel spring is a resilient body. In contrast, a spring of copper wire or a clay is a plastic body, because it deforms permanently even with the effect of small force. An elastic body will suffer permanent deformation, when the force that distorts it surpasses the body's elasticity limit. It breaks when it crosses its fracture limit. The Hooke's Law or the law of elasticity says that elongation x of a spring in its elasticity regime is proportional to the power of the F that causes it:

$$F=k\cdot x \qquad (1)$$

Where k The constant of the ratio.

We call it the constant k, as "spring $c$onstant", while its value characterizes the stifness of the spring and depends on the geometric characteristics of the spring (length, thickness etc.). It has a unit of measurement *1 N/m*.

The law of elastic deformation is based on the measurement of a force with the help of the dynamometer. When we hang a body by a steel spring, the elongation depends on the weight of that body. Twice the weight causes twice as much elongation. So, hanging different bodies of known weights and noting the corresponding deformations we can grade the spring and build a dynamometer!



***Pict. 1**: Dynamometer*

Experimental part

Instruments, apparatus and materials:

1. Ruler
2. Iron Hook
3. Iron Base
4. Iron rod
5. Masses of 50 gr
6. Body of unknown mass
7. 2 Springs

Experimental procedure:

1. Assemble the experimental device of FIG. 2.

2. Hang on the hook on one of the springs. The hook serves as an indicator on the edge of the spring.

3. Set the ruler in such a way that the zero mark is on the same line as the hook.

4. At the end of the spring, hang a weight. Note the value of the elongation x of the spring.

***Pict. 2**: Experimental apparatus*

5. Repeat the procedure 4 more times by adding same weight each time, recording the elongation x the spring and the force exerted F=B (weight of pellets). Remember that the weight B of a body is calculated from the relationship: B $=mg$, where g=acceleration of gravity. For your calculations use $g = 10\ m/s^2$.

6. Fill in table 1.

Table 1

Spring A		**Spring B**	
B (N)	*x (cm)*	*B (N)*	*x (cm)*

1. Follow steps 2 through 6 for the second spring.

2. To design the graph $F - x$ for spring A.

3. On the same axes, do the graph for the B spring.

4. What format do the graphs have? The Law of Hooke; Articulate him.

5. Hang from the spring a body of unknown weight and record elongation x of the spring.

x (cm)

13. From the graphs you have done can you calculate the weight of the unknown body?