PHYS 211 Lab Practicum 1: Information and Guidelines

You will have **1 hour and 15 minutes** to formulate a plan, execute, and prepare a report in response to the **prompt** you are assigned from the list of three shown below. Use any tools and resources available in the lab to assist you. On the lab bench you will be provided with the prompt assigned to you, all necessary equipment, the Core Elements, and the lab manual. You will also be provided with paper for the written lab report. Bring your lab notebook, a pen, and a calculator with you to the practicum.

Throughout the practicum, **you *must* keep a log of your experimental procedure and reasoning** to be handed in as a final report for the lab practicum grade:

- Use the Core Elements for a lab notebook entry to guide your write-up. The write-up should include appropriate elements such as a lab header, purpose, apparatus, procedural details, data, graphs, analysis, and a conclusion. At the end of this document, you will find a description of the Assessment Criteria.

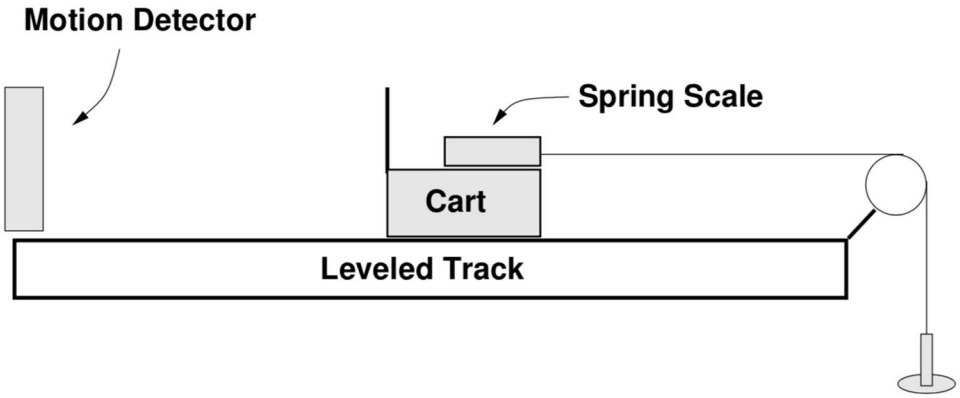
- We will scan up to 5 pages (front and back) of your submission, including the cover page. Ideally, your written description should be 1-2 pages, with any Excel or other printouts included as separate sheets, labeled, and referred to in your write-up. **Do NOT cut-and-paste print-outs into your report pages; simply add them as additional pages at the end of your submitted report**. Do not staple.

- Include your name on each page of your report.

Please note that you will not repeat one of the previous labs; **instead, you will be assigned one of the following three prompts**. The numbers may change in the actual practicum.

Prompt A (Two-Body System):
Use the tools and resources available to you in the lab to experimentally explore the following situation:

Consider the two-body arrangement you used in Lab 5.



By applying Newton's second law, you showed that the acceleration of the cart was predicted to be:

$$a = \frac{m_w g}{(m_w + m_c)}$$

where m_w is the mass of the hanging weight (including hanger), m_c is the mass of the cart, and g is the gravitational acceleration (9.8 m/s^2). Consider the case where the mass of the hanging weight is m_w = 100 g.
Do five measurements each of a_{left} and a_{right} to obtain five values for $a_{isolated}$. You will use the Logger *Pro* template *211mot_promptA.cmbl* located in the public netspace folder *PHYS 211_212 Lab → 211Lab → Lab_Practicum1*. Be sure to explain how friction between the track and the cart are taken into account. Report your experimental result for $a = a_{isolated}$ (including uncertainty). Determine the predicted value for a, and conclude whether your experimental result and this predicted value are consistent based on your analysis.

OR

Prompt B (Pendulum):
Use the tools and resources available to you in the lab to experimentally explore the following situation:

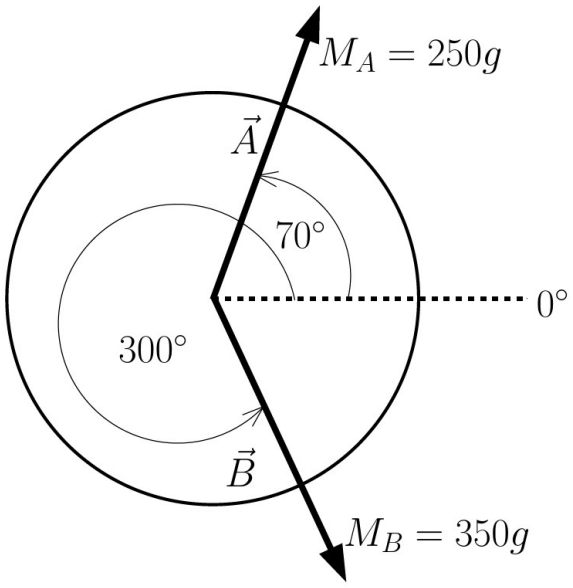
Determine if the **mass** of a pendulum bob *significantly* affects the period of a pendulum. Use the two provided pendulum bobs (of different masses) for your measurements. Do all measurements for the *same* small angle of amplitude. For each mass make five measurements of the time to complete 10 swings; i.e., measure the times $T_{BigMass}$ and $T_{SmallMass}$ each five times. Apply statistical analysis to ($T_{BigMass}$ - $T_{SmallMass}$), and report your result (including uncertainty). Conclude whether the mass of a pendulum bob significantly affects the period of a pendulum based on your analysis.

OR

Prompt C (Force Table):

Use the tools and resources available to you in the lab to experimentally explore the following situation:

The force table on your bench has been set up with two masses in the arrangement shown in the figure below. **Experimentally** determine the mass (M_C) and the angle (θ_C) of a third mass necessary to balance the central ring. Also measure the corresponding uncertainties of M_C and θ_C. Use the EXCEL template *prac1_promptC_template_fa2024* located in the public netspace folder *PHYS 211_212 Lab → 211Lab → Lab_Practicum1*. For uncertainty propagation, consider only uncertainties in the mass and the angle in the third mass as the dominant sources of uncertainty. Report your results (including uncertainty) for $F_{net,x}$ and $F_{net,y}$.
To check Newton's first law for static equilibrium, conclude whether your experimental results (including uncertainties) are consistent with the prediction that the sum of the forces is zero.



(Assessment Criteria on the following page.)

Assessment Criteria

Practicum reports will be assessed according to the following five criteria, each given equal weight (maximum 3 points each for a maximum 15 points total). Of greatest importance is the student's ability to clearly communicate their experiment and interpret their results.

1. A clear, concise statement of the experimental goal. (Core Elements: Lab Header and Purpose)

2. A clear, complete sketch of the apparatus and description of the experimental details, including the procedure used, choices made concerning data collection (equipment used, number of trials, etc.). It should contain enough detail to allow someone else to reproduce the experiment accurately. Where applicable the report should also include a description of uncertainties in the measurement process. (Core Elements: Apparatus and Data)

3. A complete record of data collection and presentation. This section may include tables and graphs appropriately labeled and annotated. Since any printouts will be handed in on a separate sheet of paper, figures and tables should be labeled (Fig. 1, Fig. 2, Table 1, Table 2, etc.) and referenced in the report. (Core Elements: Data, Graphs, Computer Files)

4. A clear, concise description of the analysis undertaken to achieve the experiment's goal. This description should include all analysis of uncertainties. Any calculations using the measured data should be clearly documented. If repetitive, then show one representative calculation. If EXCEL is used, include a printout of the sheet and annotate representative examples for what you typed into the cells. (Core Element: Analysis)

5. A final statement that summarizes the result of the experiment (quoted in correct scientific format) and the conclusions that can be drawn. If appropriate, this statement should also include comparisons between experimental measurements and theoretical predictions. (Core Element: Conclusion)