

Formalities

If you'll just add the following text at the beginning of all your syllabi, you'll be good to go (this is the PREFERRED method so that any updates propagate to all syllabi):

Standard Lyon College Policies are incorporated into this syllabus and can be found at the following link: <http://www.lyon.edu/standard-course-policies>.

If you really just want to copy and paste all the policies into your syllabi instead (NOT preferred), you can, *but be sure and use the exact wording found at the link above and include all of it.*

Tentative Syllabus for Physics Lab 241: Fall 2024

Professor: Dr. Stuart Hutton

Office: Derby Center: 248 Research Lab: Derby 219: General Physics lab: 148

SMS: 307.***.8765 /lab email: lyonphysics@<*.com> web: physics.lyon.edu

Phone: [***.307.7560](tel:307.307.7560) Email: stuart.hutton@lyon.edu

Note this very clearly: labs are due by lab time 1 week after completing the lab. Labs are not accepted more than 2 weeks after completion of the lab (this includes the time required for revisions) and your final grade will be reduced by a letter grade each time. **Additionally NO labs will be accepted after the last day of classes which is December 06, 2024. If you fail to receive accepted for more than 3 labs, you will fail the course.** Any required revisions must be completed within the same 2 week time frame (the 2 week time frame starts on the day of the lab) or they are not accepted which again results in your final grade being reduced by a letter grade.

[Location:Section:Meeting times] =

[Derby 148:1:W 13:00-15:50,2:R 13:00-15:50,3:F 13:00-15:50]

Grading

As a general guide to grades, grades will be assigned as follows:

100-90] A	(90-80] B	(80-70] C	(70-60] D	<(60 F
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There are about 10 labs this semester and each lab provides 10 points in your final grade. The particular grade in each individual lab is awarded as follows: 100% of the grade (or 7 points) is awarded for successful completion of the lab awarded contingent upon submission of an acceptable lab report following the guidelines and rubric on the lab website. Note, however, that in the event that an acceptable lab report is not submitted, the lab is considered to not have been done and the final course grade will be lowered by 1 letter grade. **If you fail to submit more than 3 accepted reports, you will fail the course.** Each student is to submit an individual and independent electronic lab report (in pdf format only) for each experiment completed based upon data obtained in lab during FA24 and the report must be accepted in order to obtain credit. You will have the opportunity to respond to comments from the received electronic labs and then revise and resubmit your reports. Refer to Student Learning Outcomes for a discussion of minimal course outcome expectations.

Note: If you miss one of the labs when experiments are done and it is not made up, your lab grade will be lowered by one letter grade for each missed lab which is not made up. The full lab, including writeup, must be completed or your grade will be reduced by one letter grade for each lab not fully completed. You must make up any excused absences at the first opportunity.

It is important that you understand what you did during the lab before turning the lab report in to your professor. Your work on lab write-ups will be graded for correctness, clarity and completeness. If you want full credit for a lab, **you must** supply the logical steps that led to the result and the result **must include proper units**. You should supply sample calculations where appropriate. Diagrams and graphs should be included where appropriate. Aside from data tables and graphs, the components required for the proper lab write-up should take about 2 - 3 pages maximum for any given lab. Be sure that each lab starts with a cover page as indicated in the lab write-up guidelines. Make sure that your lab write-up is in the form of paragraphs with correct English grammar as indicated on the lab write-up guidelines. Failure to follow the guidelines will negatively impact your grade.

**Phy241 is a separate course from either Phy210 or Phy240.
The grade in Phy241 has no impact upon the grade in either Phy210 or
Phy240 except as a co-requisite.**

In this course, your grade will depend upon successful completion of lab experiments and reports. **You are also expected to have read the lab before coming to class and to have reviewed the lab material.** You should bring your text, a calculator, and paper to lab. Labs will be completed and submitted during lab. In order to do this, you will need to come to lab on time. Making up the lab for such absences is normally not permitted: it is thus in your interest to show up to lab on time. Additionally, you should **never plan** other activities during the lab period since labs normally will occupy the entire period. Your prime learning resource is the classroom: **punctual** and **complete** class attendance is expected. **Absences will negatively impact your final grade.** Do not show up late to lab because the entire lab has to wait on your appearance.

Lab report formats

If you miss a lab for an excused reason, you must make up the lab as soon as possible. If you fail to hand in a lab report late which is accepted, you will lose a minimum of 10% of your grade final grade. Labs must be submitted in **pdf** format electronically. **When including spreadsheet screen captures in your reports, be sure to format tables so they fit on the page and are completely readable. I should be able to read your lab (as a single document in pdf format) without having to change anything. This means, check (proofread) your pdfs before you send them to make sure you can read them. Specifically, you must check your sent email to confirm that any attachments sent were correctly attached, could be opened, and were in pdf format. Do not submit links to documents; your report is a pdf attachment to your email.**

If you miss one or more of the labs without makeup, your lab grade will be lowered by one letter grade for each missed lab which is not made up. Do not submit non-pdf attachments or corrupted files via email and expect to obtain extra time to complete the lab.

Course Description

In this course you will be exposed to the experimental side of physics. Among the topics that we will investigate are mechanics, waves, and thermodynamics.

Course Objectives

As a consequence of this course, you should obtain an enhanced understanding of the experimental nature of physics. In addition, you should come away from this course with an ability to interpret data in a scientifically valid manner and to have increased experience with writing brief technical reports. Refer to Student Learning Outcomes for a discussion of minimal course outcome expectations.

Course Prerequisites

In order to be taking the physics lab, you must be currently enrolled in either physics 210 or physics 240 and therefore you must satisfy the prerequisites for those courses.

Text

The text will consist of handouts in electronic format obtained via the physics gateway at: <http://physics.lyon.edu>

Academic Integrity

Each student is to submit an individual and independent electronic lab report for each experiment completed and the report must be accepted in order to obtain credit. Students are specifically prohibited from reference to lab reports prepared by other students or work performed in previous semesters in the preparation of their own reports. However, you are encouraged and expected to feel free to ask colleagues questions during lab and in the preparation of your reports. Never-the-less, **your submission must represent your own work.** And, as a note: if you try to use AI to do this, you can almost be sure you're going to get the physics wrong (I have tested this several times.) In short, don't use AI; it does not represent your own work and it's going to almost certainly be wrong. I consider the use of AI to write your submissions to be an honor code violation.

CLASS SCHEDULE / OFFICE HOURS Fall 2024

Professor: Stuart Hutton

Monday	Tuesday	Wednesday	Thursday	Friday
8:00-8:50 PHY240.01 Fundamentals of Physics I Derby 007	8:00-9:15	8:00-8:50 PHY240.01 Fundamentals of Physics I Derby 007	8:00-9:15	8:00-8:50 PHY240.01 Fundamentals of Physics I Derby 007
9:00-9:50 PHY210.01 General Physics 1 Derby 007		9:00-9:50 PHY210.01 General Physics 1 Derby 007		9:00-9:50 PHY210.01 General Physics 1 Derby 007
10:00-10:50 Phy335.01 Modern Physics Derby 148	10:00 - 10:50	10:10-10:50 Office Hours	10:00 - 10:50	10:10-10:50 Office Hours
11:00-11:50 Office Hours	11:00-11:50 Phy335.01 Modern Physics Derby 148	11:00-11:50 Phy390.01 Seminar Derby 148	11-11:50	11:00-11:50
12:00-12:50	12:00-12:50	12:00 - 12:50	12:00 - 12:50 Phy321.01 Astrophotography Derby 148	12:00 - 12:50 SGA
	13:00-14:50	13:00-15:50 PHY241.01 Fundamentals of Physics Lab 1 Derby 148	13:00-15:50 PHY241.02 Fundamentals of Physics Lab 1 Derby 148	13:00-15:50 PHY241.03 Fundamentals of Physics Lab 1 Derby 148
14:00-14:50 Phy335.01 Modern Physics Derby 148				
	16:00-16:50 Div Meetings	16:00-16:50 P&T <u>Worthington</u>		

Schedule for Phy210, Phy240, and Phy241: Fall 2024: Revision 02

labs	Worksheet Number	Date	210: Cutnell: 8 th ed. Assignment Reading : Homework	240:Serway 4 th ed Assignment: Reading: homework
[RF: No Lab]	Class Initialization	F August 16	Chapter 01: Units, vectors, math and trig	Chapter 01 Introduction and Vectors
	Worksheet 01 units trig	M August 19	Chapter 01:H01	Chapter 01:H01
WRF Lab 00	Worksheet 02 1d motion	W August 21	Chapter 02:H02: 1d motion	Chapter 02:H02 1d motion
	Worksheet 03 free fall	F August 23	Chapter 02:H03	Chapter 02:H03
	Worksheet 04 2d motion1	M August 26 UQ01	Chapter 03:H04: 2d motion	Chapter 03:H04: 2d motion
WRF Lab 01: Forces & Vectors	Worksheet 05a 2d motion2	W August 28	Chapter 03:H05	Chapter 03:H05
	Worksheet 05 2d motion2	F August 30	Chapter 03:H05	Chapter 03:H05
	Labor Day (no classes)	M September 02		
WRF Lab 02: Problems: 1 and 2 D motion	Worksheet 06 force1, fbd	W September 04 UQ02	Chapter 04:H06: Forces, fbd	Chapter 04:H06 Forces, fbd
	Worksheet 07 force 2, fbd	F September 06	Chapter 04:H07	Chapter 04:H07
	UnTest#1	M September 09		
WRF Lab 03: Planes & Friction	Test 1	W September 11		
	Worksheet 08 inclined plane	F September 13	Chapter 06:H08: work and energy	Chapter 06:H08 Energy and Energy Transfer
	Worksheet 09 inclined 2	M September 16 UQ03	Chapter 06: H09	Chapter 07:H09 Potential Energy
WRF Lab 04: Atwood's, mechanical advantage, work & Energy	Worksheet 10 energy 2	W September 18	Chapter 07:H10: impulse, momentum	Chapter 08:H10 Momentum and Collisions
	Worksheet 11 spring energy	F September 20	Chapter 07: H11	Chapter 08:H11
	Worksheet 12 collisions1	M September 23 UQ04	Chapter 05:H12: Uniform Circular Motion	Chapter 10:H12 Rotational Motion
WRF Lab 05: Centripetal Force & Hooke's Law	Worksheet 13 collisions2	W September 25	Chapter 08:H13: Rotational Kinematics	Chapter 10:H13
	Worksheet 14 ucm 1	F September 27	Chapter 08: H14	Chapter 10:H14
	Worksheet 15 acc frames	M September 30 UQ05	Chapter 09:H15: Rotational dynamics	Chapter 10:H15
WR: Lab TBA	Worksheet 16 non ucm	W October 02		
	Hurkle-Durkle Day	F October 04		
	UnTest#2	M October 07		
WRF Lab 06: Static Equilibrium	Test 2	W October 09		
	Worksheet 17: Rotate2 energy	F October 11	Chapter 09: H17	Chapter 10:H17
	Worksheet 18 Torque, L	M October 14 UQ06	Chapter 09: H18	Chapter 10:H18
WRF Lab 07: Simple Harmonic Oscillation	Worksheet 19 statics	W October 16	Chapter 10: H19 Simple Harmonic Oscillation	Chapter 12:H19 Oscillatory Motion
	Worksheet 20 osc1:spring	F October 18		
	Worksheet 21 osc2:pendulum	M October 21 UQ07		
WF: Lab TBA	Worksheet 22 string waves1	W October 23	Chapter 10: H20	Chapter 12:H20
	Service Day	R October 24		
	Worksheet 23:string waves2	F October 25	Chapter 10: H21	Chapter 12:H21
	Worksheet 24 sound waves	M October 28 UQ08	Chapter 16:H22 waves and sound	Chapter 13:H22 Mechanical Waves
WRF Lab 08: Standing Waves and Vibrations	Worksheet 25 beats, Doppler	W October 30	Chapter 16:H23	Chapter 13:H23
	UnTest 3	F November 01		
	Test 3	M November 04		
WRF Lab09: Archimedes' Principle & Pressure	Worksheet 27 therm 01	W November 06	Chapter 12: Temperature and Heat	Chapter 16: Temperature and the kinetic theory of gasses
	Worksheet 28 therm 02	F November 08	Chapter 13:H27: transfer of heat	Chapter 16:H27
	Worksheet 29 therm 03	M November 11 UQ09	Chapter 14:H28: IDG and kinetic theory	Chapter 17: H28:Energy in Thermal Processes: 1 st law of thermo
WRF Lab 10: Thermodynamics	Worksheet 30 therm 04	W November 13	Chapter 15::H29: thermodynamics	Chapter 18: H29: Heat Engines, Entropy, and the 2 nd law of thermo
	Worksheet 30 (continued)	F November 15	Chapter 15: H30	Chapter 18:H30
	Worksheet 26	M November 18 UQ10	Chapter 17: H25	Chapter 14:H25
WRF: Lab TBA	Worksheet 31 Fluids 1	W November 20	Chapter 11: H31: Fluids	15: H26:Fluid Mechanics Sections 15.1 - 15.4 Chapter 16: H31:Fluid Mechanics: Sections 15.5-15.9
	Untest #4	F November 22		
	Thanksgiving Break	M November 25 - 29		
	Test 4	M December 02		
[WRF: No Lab]	Gravitational Interactions	W December 04		
	Course Review / last day	F December 06	Final Exams	December 09-13

Physics Problem Solving Rubric Rev FA2024

Note: this rubric indicates the process for completion of physics problems. Since our tests are multiple choice, this should be viewed as a self-guided checklist for successful and complete problem completion. For sample calculations in lab reports, you should follow this rubric closely.

	1	0.7	0.4	0
<p>1, Critical Thinking:</p> <p>Solution started correctly.</p> <p>Note: sketches may be considered here as required in problem statement.</p>	<p>correct approach</p> <p>If required, sketches were correct.</p>	<p>approach would lead to correct result</p> <p>Sketches miss one label or some other component absent or incorrect.</p>	<p>Something is right in the approach but insufficient to reach problem solution.</p> <p>Sketches miss multiple labels, directions incorrectly indicated</p>	<p>incorrect approach</p> <p>Sketch not present or not at all correctly labeled.</p>
<p>2. Quantitative Literacy:</p> <p>Solution proceeded quantitatively</p>	<p>Mathematical operations correct and units correct</p>	<p>Mathematical operations and units correct however an error usually related to incorrect units or the final numerical result present</p>	<p>Mathematical operations have some correct steps but misapplication or other errors prevented problem completion. Units reported in final result not present or incorrect .</p>	<p>Necessary mathematical operations incorrect and units absent</p>
<p>3, Scientific Thought & Informational Literacy</p> <p>Note: this may be contained within an equation starting the problem solution.</p>	<p>correctly stated physical principle or law and physical terminology needed to solve problem.</p>	<p>physical principle or law used shown however omission or extraneous material present. physical terminology needed to solve problem used but not complete or absent important concept.</p>	<p>statement of physical principle or law present but would not apply to present problem so as to lead to solution. physical terminology needed to solve problem incomplete and would not have lead to problem completion.</p>	<p>no statement of physical principle/ law or incorrect physical principle/ law. Did not use physical terms needed to solve problem or incorrect terms used.</p>

Problem scoring: maximum per **problem section** is about 5 points, some sections may have fewer points. In a test containing 4 problems, this equates to 25% of the total test score. The final score per problem is calculated as follows:

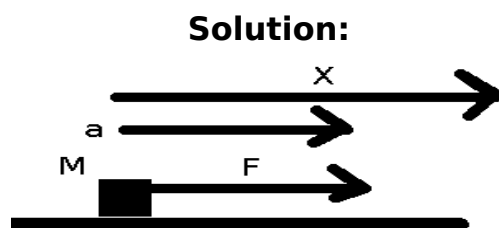
$$P_i = \frac{\text{total number of points from rubric}}{\text{maximum rubric points per problem}} \times \frac{100}{\# \text{ of problems on test (normally 4)}}$$

The test score is then determined by

$$\text{percentage test grade} = \sum_{i=1}^{i=\text{Number of problems on test}} P_i$$

Example of a complete solution

Find the vector position at time t of an object of mass M when subjected to a constant force $\vec{F}=F\hat{x}$ for a time t if the object was initially at $x=0$ and at rest. Provide a numerical result with correct SI units for $F=1$ N, $M=1/2$ kg and $t=2$ s. Include a correctly labeled sketch showing F acting on M , a and x .



$$\text{Newton's law: } \vec{F}=M\vec{a} \Rightarrow \vec{a}=\frac{\vec{F}}{M}; \vec{F}=F\hat{x} \Rightarrow \vec{a}=\frac{F}{M}\hat{x} : a_x=\vec{a}\cdot\hat{x}=\frac{F}{M}$$

Constant force : kinematic equations of motion in x direction for position:

$$x=x_0+v_{x,0}t+\frac{1}{2}a_x t^2$$

Object initially at rest: $v_{x,0}=0$ m/s . Object initially at $x=0$: $x_0=0$ m .

Kinematic equation reduces to: $x=\frac{F}{2M}t^2$

$$\text{With numerical values: } x=\frac{1\text{ N}}{2\left(\frac{1}{2}\text{ kg}\right)}(2\text{ s})^2=4\frac{\text{Ns}^2}{\text{kg}}=4\text{ m}$$

Final answer with vectors: $\vec{x}=4\text{ m}\hat{x}$

Score:

1: Started with Newton's law and used correct equation of motion, additionally a correctly labeled sketch was drawn showing correct vector directions as was required=1

2: Algebra (including vectors) correctly lead to final result, unit algebra correct=1

3: Correctly used physical information in the problem which were mass M , initial conditions (at $x=0$, at rest) , time t , constant force, vector directions. Correct numerical quantities (including correct vectors) provided in final result with correct SI units reported=1

Notes on the lab write-up for physics labs Fall 2024

Your first (cover) page should include the following information:

Your Name, Date, Partners, Title of Experiment and the abstract.

(Then insert a page break)

Each lab must be the unique written effort of the student submitting the report. You may NOT reference or use lab reports (prepared by others) in your report preparation although you are most certainly encouraged to talk to your lab colleagues.

Lab reports must be electronically submitted to the appropriate address as a single pdf document. Links to external documents are not accepted.

Title: Concise wording that describes the essence of the lab.

Abstract - a summary of your research including general methods and major conclusions. This is usually one paragraph long and should convince someone to read your paper. Include a statement of your hypothesis here and if data supported it.

Introduction: An overview of your experiment, statement of hypothesis, what you did and what the theory was behind the experiment.

Methods: - A brief discussion of experimental techniques. Diagrams are usually appropriate in this section.

Results -written usually in the past perfect tense or passive voice; describes your findings, data collected, and includes data tables, graphs, general trends, derived formulas, etc. All work and data tables must be shown here. In general, you need to have a copy of your original data with you but the data included in the lab report can be copied from your original data. Data should be absent of obvious errors (since you would have tracked down these items).

Discussion and analysis - tense can vary, describes your results in relation to other data, discusses problem associated with the lab, postulates trends in the data, predicts results given different circumstances, suggests sources of error, etc. Discuss how the data supports, or does not support your hypothesis and how well such support is in terms of error analysis such as percent differences. **Be sure to include sample calculations in this section.**

Literature Cited - a list of books, articles, etc., that you used to assist you in presenting your data and which were referred to in the write-up. **When citing a reference from the internet, you MUST include the URL that points directly to the document so that a single click of the mouse will bring up that exact document. Every lab report will have at least 1 citation or the report will not be accepted.**

Your presentation of the lab is important. Be sure it is grammatically correct and neatly typed. Be careful of tense changes within a paragraph. Data collected during a lab must be authentic. "Fudging" is unacceptable and unnecessary.

Lab write-ups should be as **concise** as possible within these guidelines. I am not looking for exhaustive tomes of work in a lab write-up.

Physics Lab Grading Rubric Fall 2024

Note: Each student has the opportunity to revise deficient portions of the lab report during the lab period except for teamwork, arrival and departure. This should be regarded as a guide to required elements of a completed lab.

	1	0.5	0
Scientific Thought	Hypothesis in abstract and introduction. Supporting evidence (or non-supporting) discussed in conclusion.	Hypothesis in abstract and introduction but not relevant and supporting evidence (or non-supporting) not discussed in conclusion.	Hypothesis absent in abstract and introduction; Supporting evidence (or non-supporting) not discussed in conclusion
Critical thinking	Correct discussion of experiment, and how results relate to hypothesis.	Incomplete discussion of experiment and how results relate to hypothesis	poor or absent discussion of experiment, and how results relate to hypothesis.
Inquiry and Analysis	Complete discussion of experimental technique and data results	incomplete discussion of experimental technique and data results	poor or absent discussion of experimental technique and data results
Informational Literacy	Correct physical terminology contained in report. At least one reference present.	incomplete physical terminology contained in report. Reference present but not correct.	incorrect or absence of physical terminology contained in report. Reference not present.
Quantitative Literacy	Correct usage of calculations including spreadsheets	correct usage of calculations including spreadsheets but something significant missing	Absent or incorrect usage of calculations including spreadsheets
Teamwork	Successful team completion of lab		Unsuccessful team completion of lab
Arrival	on time		tardy or absent
Departure	Work space returned as it was when arriving		Workspace left in disorder upon departure
Overall report	All required elements present		Required elements missing.
Quality	experimental results presented without obvious errors		experimental results presented with obvious errors

Safety regulations for General Physics Labs Fall 2024

During labs, I will normally wear a face mask.

- (1) Anytime springs are used in lab, safety goggles must be worn.
- (2) Anytime boiling water is used in lab, safety goggles must be worn.
- (3) You should not look at laser light or point it towards other people.
- (4) In the event of a spill (which will be water), dispense a towel from the spill kit (aka towel dispenser) and wipe up the spill.
- (5) Food and drink are not permitted in lab.

Attach this form to your email (as an extra attachment today) when you send in your introductory lab report. In your lab report, right below your name, you should say this:
I have read the safety regulations attached to this email.

Student Learning Outcomes for the Physics Program at Lyon College FA2024

1. Students who complete the physics 210/220, 240/250, 241/251 sequence are able to

1a. Articulate the basic principles of physics.

1b. Apply the basic principles of physics to solve a variety of qualitative and quantitative problems at the introductory physics level.

This can be measured with portions of exam problems.

General Education learning outcomes for Phy 210/Phy240/ Phy241/Phy220/Phy250/Phy251

Critical thinking: 210,240.241,220,250,251

Inquiry and analysis: 241.251

Quantitative literacy: 210,240.241,220,250,251

Scientific thought and information literacy: 210,240.241,220,250,251

Portions related to Phy:241,251 will be evaluated by percentage numbers of accepted labs. Students are allowed to submit revised reports. Portions related to Phy:210,240,220/250 rubric will have results recorded from exams.

Critical thinking is regularly evaluated in 210,240.241,220,250,251. It is evaluated in terms of starting with correct physical principles applicable to a given situation and being able to follow it through to completion. It is evaluated by use of exam problems. In 241/251, it is part of the process of scientific thought and is evidenced by use of supporting data for a hypothesis as is required by the lab rubric.

Inquiry and analysis is regularly evaluated in 241/251 as part of the required element of accepted lab writeups. It is evidenced by student explanation of the experiment and is a required element by the rubric.

Quantitative literacy is evidenced primarily in 210/240/220/250 by successful completion of physical problems with correct units and correct numerical operations. It is evaluated by use of exam problems. Quantitative literacy is exhibited in 241/251 by students being able to follow through with sample calculations sometimes partially enabled by spreadsheet examples and being able to interpret the results. This is evidenced by the accepted writeup and is a required element by the rubric.

Scientific thought and information literacy is regularly evaluated in 241/251 and is evidenced by use of hypothesis with supporting evidence (or not supporting evidence) based upon experiment as is required by the lab rubric. Information literacy is regularly evaluated in 241/251 and is evidenced by correct physics terminology in lab reports as required by the lab rubric. It is also a significant portion of 210/240/220/250 and is evidenced by student success in using the basic physical terminology enabling students to correctly initiate quantitative solutions to physical situations.