Lyon College: Standard Course Policies, Spring, 2023

These policies apply to all courses offered at Lyon College. Details related to a specific course can be found in the rest of the course's syllabus.

Honor Code

All graded work in this class is to be pledged in accordance with the Lyon College Honor Code. The use of a phone for any reason during the course of an exam is considered an Honor Code violation.

Class Attendance Policy

Students are expected to attend all class periods for the courses in which they are enrolled. They are responsible for conferring with individual professors regarding any missed assignments. Faculty members are to notify the Registrar when a student misses the equivalent of one, two, three, and four weeks of class periods in a single course. Under this policy, there is no distinction between "excused" and "unexcused" absences, except that a student may make up work missed during an excused absence. A reminder of the college's attendance policy will be issued to the student at one week, a second reminder at two weeks, a warning at three weeks, and notification of administrative withdrawal and the assigning of an "F" grade at four weeks. Students who are administratively withdrawn from more than one course will be placed on probation or suspended.

Academic Support

The Morrow Academic Center (MAC) helps students who want to improve grades by providing peer-led services including Supplemental Instruction (SI), tutoring, the Writing Center, and academic coaching as well providing 24-hour, online tutoring for all subjects through Tutor.com. A schedule of peer-led services is available at lyon.edu/mac and Tutor.com is accessed through courses in Schoology. Contact Donald Taylor, Director of Academic Support, at 870-307-7319 or donald.taylor@lyon.edu for more information about MAC services.

Technology Support

For general technology support, you can contact the IT department by emailing support@lyon.edu or by calling 870-307-7555. For assistance with classroom-related technologies, such as the learning management system (LMS), you can request support using the methods above, or you can contact sarah.williams@lyon.edu directly for assistance.Your course content will be accessible digitally using either the Schoology or Canvas LMS. Both LMS platforms will use your myLyon credentials for your student login.

- For Canvas, login at lyon.instructure.com
- For Schoology, login at lyon.schoology.com

Disabilities

Students seeking reasonable accommodations based on documented learning disabilities must contact Director of Academic Support Donald Taylor in the Morrow Academic Center at (870) 307-7019 or at donald.taylor@lyon.edu.

Harassment, Discrimination, and Sexual Misconduct

Lyon College seeks to provide all members of the community with a safe and secure learning and work environment that is free of crime and/or policy violations motivated by discrimination, sexual and bias-related harassment, and other violations of rights. The College has a zero-tolerance policy against gender-based misconduct, sexual assault, and interpersonal violence toward any member or guest of the Lyon College community. Any individual who has been the victim of an act of violence or intimidation is urged to make an official report by contacting a campus Title

IX coordinator or by visiting www.lyon.edu/file-a-title-ix-report. A report of an act of violence or intimidation will be dealt with promptly. Confidentiality will be maintained to the greatest extent possible within the constraints of the law. For more information regarding the College's Title IX policies and procedures, visit www.lyon.edu/title-ix.

Mental & Behavioral Health

Lyon College is dedicated to ensuring each student has access to mental and behavioral health resources. The College's Mental and Behavioral Health Office is located in Edwards Commons and is partnered with White River Health System's Behavioral Health Clinic. The office is committed to helping the Lyon community achieve maximum mental and behavioral wellness through both preventative and reactive care. A full-time, licensed, professional counselor provides counseling, consultations, outreach, workshops, and many more mental and behavioral services to Lyon students, faculty, and staff at no cost. The Mental and Behavioral Health Office also provides access to White River Health System's services and facilities, including medication management and in-patient and out-patient care. To make an appointment, contact counseling@lyon.edu.

College-Wide COVID-19 Policies for Spring, 2023

- The College does not require masks in instructional and meeting spaces inside academic buildings. However, if instructors require masks in their classroom, lab, or studio, then students and guests must comply with that requirement.
- Vaccines are strongly encouraged for all faculty, staff, and students. Vaccines are not mandated for Lyon College community members, although there may be specific courses involving interactions with vulnerable, external populations where a vaccine may be required.
- The College will continue to offer symptomatic testing for students, faculty and staff.

The rest of a course's syllabus will include at least the following:

- A description of the course consistent with the Lyon College catalog.
- A list of student learning outcomes for the course.
- A summary of all course requirements.
- An explanation of the grading system to be used in the course.
- Any course-specific attendance policies that go beyond the College policy.
- Details about what constitutes acceptable and unacceptable student collaboration on graded work.
- A clear statement about which LMS is being used for the course.

Lyon College Course Syllabus

Course Number and Section:Phy251.01 (W), Phy251.02 (R), Phy251.03 (F)

Course Title: Fundamentals of Physics lab 2

Course Meeting Days/Times: WRF 13:00-15:50 Semester/Year:SP2023

Professor's Information

Name Stuart Hutton

Office Location: Derby 248 Office Hours: MWF 10-10:50/AR

E-mail Address: stuart.hutton@lyon.edu Phone Number: ***.307.7560

Physics: Email: lyonphysics@*****.*** SMS:307.***.8765 Gateway: physics.lyon.edu

Standard Policies

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Details specific to this course may be found in the subsequent pages of this syllabus. Those details will include at least the following:

1. A description of the course consistent with the Lyon College catalog.
2. A list of student learning outcomes for the course.
3. A summary of all course requirements.
4. An explanation of the grading system to be used in the course.
5. Any course-specific attendance policies that go beyond the College policy.
6. Details about what constitutes acceptable and unacceptable student collaboration on graded work.
7. A clear statement about which LMS is being used for the course. **We will use schoology this spring.**

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- The College will continue to offer symptomatic testing for students, faculty and staff

In class, labs and visits during my office hours:

Social distance must be maintained even with PPE, at least from me.

Appropriate masks must be worn that cover the nose and mouth.

Contravention of these guidelines will potentially lead to dismissal from lab or class.

Tentative Syllabus for Physics Lab 251: Spring 2023 Pandemic
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 Email: stuart.hutton@lyon.edu**

During class periods, cell phones are to be switched off.

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

100-90]	(90-80]	(80-70]	(70-60]	<(60
A	B	C	D	F

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: 70% of the grade is awarded for successful completion of the lab awarded contingent upon submission of an acceptable lab report. The other 30% is awarded for submission of an acceptable 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 per uncompleted lab. Each student is to submit an individual and independent lab report for each experiment completed in order to obtain credit with each student submitting an electronic lab report. You will have the opportunity during lab 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. For in class problem sessions, 10 points is awarded for successful completion.

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.

A portion of your lab grade from any particular experiment may come from oral answers to questions when you turn in your lab report or lab quizzes. Thus, 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. **Failure to supply details leading to a result will result in very little credit for a lab**. 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.

Phy251 is a separate course from either Phy220 or Phy250.
The grade in Phy251 has no impact upon the grade in either Phy220 or Phy250 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 viewed accompanying materials. You should bring your text, a calculator, and paper to lab. Labs will be completed and submitted after lab data collection. In order to do this, you will need to come to lab on time. You can not show up late for lab. Labs start at 13:00 . It is necessary to come prepared, ready to collect data, and finish at the appropriate time. Simply said, do not come late. It is thus in your interest to show up to lab on time and do not come unprepared. Additionally, you should never plan other activities during the lab period since labs normally will occupy the entire period subsection. Your prime learning resource is the classroom: punctual and complete class attendance is expected. Absences will negatively impact your final grade. Tardiness is considered to be an unexcused absence and will negatively impact your final grade; in particular you should not expect to arrive late and be permitted to do the lab. Use of a networked device to communicate during lab, except as required to do the lab, will be considered equivalent to an unexcused absence and a zero will be recorded for the lab grade without the possibility for a makeup.

Lab report formats

If you miss a lab for an excused reason, you must make up the lab as soon as possible. If you hand in a lab report late for an unexcused reason, you will lose a minimum of 10% of your grade. Labs must be submitted in **pdf** format electronically. **When including spreadsheets in your reports, be sure to format tables so they fit on the page. 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.**

If you miss a lab for an excusable reason, you must make up the lab for credit as soon as the schedule permits. If you schedule a makeup lab and fail to show up for the makeup, no future makeup labs will be permitted. If you miss 4 or more labs (unexcused), you will fail the course. 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. You are required to submit your completed lab writeup for the makeup lab within 3 days of completion. Do not submit non-pdf attachments or corrupted files via email and expect to obtain extra time to complete the lab. Lab reports may not be submitted after the last day of class (May 3, 2022.)

Course Description

In this course you will be exposed to the experimental side of physics. Among the topics that we will investigate are electrostatics, magnetism, and optics.

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 220 or physics 250 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: physics.lyon.edu.

Deadlines

Labs are normally due within 1 week of the lab. Revisions are due within 4 days. Multiple revisions must be completed within 1 week of the initial submission. After 2 weeks of the lab, no further revisions are accepted and your lab grade will decrease by 1 letter grade.

CLASS SCHEDULE / OFFICE HOURS Spring 2023

Office		General Lab		Research Lab
Derby 248		Derby 148		Derby 219

PROFESSOR Stuart Hutton

Monday	Tuesday	Wednesday	Thursday	Friday
8:00-8:50	8:00-9:15	8:00-8:50	8:00-9:15	8:00-8:50
9:00-9:50 PHY220.01 General Physics 2 Derby 011	9:30-10:00	9:00-9:50 PHY220.01 General Physics 2 Derby 011	9:30-10:00	9:00-9:50 PHY220.01 General Physics 2 Derby 011
10-10:50 Phy335.01 Derby 148	10:00 - 10:15 10:15-10:50 Office Hours By Appointment	10:10-10:50 Office Hours Derby 248		10:10-10:50 Office Hours Derby 248
11:00-11:50 Lunch	11:00-11:50 Phy335.01 Derby 148	11:00-11:50 Lunch	11-11:50	11:00-11:50 Lunch
12:00 - 12:50 PHY250.01 Fundamentals of Physics II Derby 148	12:00-12:50	12:00 - 12:50 PHY250.01 Fundamentals of Physics II Derby 148	11:50 - 12:40 Phy321DS.01 Phy321DS.02 Derby 148	12:00 - 12:50 PHY250.01 Fundamentals of Physics II Derby 148
13:00-14:50	13:00-13:50 Phy335.01 Derby 148	13:00-15:50 PHY251.01 Fundamentals of Physics Lab 1 Derby 148	13:00-15:50 PHY251.02 Fundamentals of Physics Lab 2 Derby 148	13:00-15:50 PHY251.03 Fundamentals of Physics Lab 3 Derby 148

Tentative Master Schedule: R.1 for Physics 220 and Physics 250 and Physics 251 Spring 2023

labs WRF	Worksheet Number	Date	220: Cutnell: 8th ed. Assignment Reading : Homework	250:Serway 4th ed Assignment: Reading: homework
L00: Introduction	**Worksheet 01: Electrostatics 1**	W January 11	chapter 18	chapter 19
		F January 13	chapter 18	chapter 19
	MLK Day	M January 16		
L01 In-Lab Problems 01	**Worksheet 02: Electrostatics 2**	W January 18	chapter 18	chapter 19
	Worksheet 03: Gauss' Law:UQ01	F January 20	chapter 19	chapter 19
	Worksheet 03A: Problems	M January 23	chapter 19	chapter 20
Lab 02: In-Lab Problems 02		W January 25	chapter 19	chapter 20
	Worksheet 04: potential : QU02	F January 27	chapter 19	chapter 20
	Worksheet 05: capacitance	M January 30	chapter 19	chapter 20
No Lab	**UnTest 01**	W February 01	chapter 19	chapter 21
	Test 01	F February 03		
	Worksheet 06: Problems	M February 06	chapter 20	chapter 21
Lab 03: Series & Parallel R	**Worksheet 07: emf, RC circuit**	W February 08	chapter 20	chapter 21
	Worksheet 08: Kirchhoff's laws 1: UQ03	F February 10	chapter 20	chapter 21
	Worksheet 09: Kirchhoff's laws 2	M February 13	chapter 21	chapter 22
Lab 04: EMF and RC Circuit	**Worksheet 10: Magnetic fields 1**	W February 15	chapter 21	chapter 22
	UQ04	F February 17		
	Worksheet 11: Magnetic fields 2	M February 20	chapter 21	chapter 22
Lab05: Current Balance	**Worksheet 12: Ampere's law**	W February 22	chapter 22	chapter 23
	UnTest 02	F February 24		
	Mental Health Break	February 25 - 28		
L06: Magnetic Levitation	**Test 02**	W March 01		
	Worksheet 13: Calculating B	F March 03	chapter 22	chapter 23
	Worksheet 14:Faraday's law	M March 06		
Lab 07: Solenoids	**Worksheet 15: Inductance**	W March 08	chapter 22	chapter 23
	Worksheet 17: RLC Circuits 1 : UQ06 (No WS 16)	F March 10	chapter 22	chapter 23
	Worksheet 18: RLC Circuits 2	M March 13	chapter 23	chapter 23
Lab 08: Oscilloscopes		W March 15	chapter 23	chapter 24
	Starting Optics	F March 17		
	Spring Break	March 18 – March 27		
	UnTest 03	M March 27		
L TBA	**Test 03**	W March 29		
Lab : TBA	**Worksheet 19: Thin Lens Eqtn. 1**	F March 31		
	Worksheet 20: Thin Lens Eqtn. 2:UQ07	M April 03		
No Lab this week	**Worksheet 21: Refraction**	W April 05	chapter 26	chapter 26
	Easter Holiday	April 07 – April 09		
	Worksheet 22: Mirror Equation	M April 10	chapter 26	chapter 25
Lab 09: focal lengths	**Worksheet 23: Multiple lenses**	W April 12	chapter 25	chapter 25
	Geometrical Optics, Ray trace:UQ08	F April 14	chapter 25	chapter 25
	Worksheet 24: Thin films	M April 17	chapter 25	chapter 27
Lab10: Reflection	**Worksheet 25: interference**	W April 19	chapter 27	chapter 28
	UQ09	F April 21	chapter 24	chapter 24
	TEM Waves	M April 24	chapter 30: 30.1 – 30.4	Chapter 29: 29.1, 29.2
Lab : TBA	**Bohr Model**	W April 26		
	UnTest 04	F April 28		
	Test 04	M May 01		
No lab this week	**Last Day of Classes**	W May 03		
	Final Exams	May 04 – May 07		

Physics Problem Solving Rubric Rev SP2023

Note: this rubric indicates the process for completion of physics problems. Since our tests are now multiple choice, this should be viewed as a self-guided checklist for successful and complete problem completion.

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

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:

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

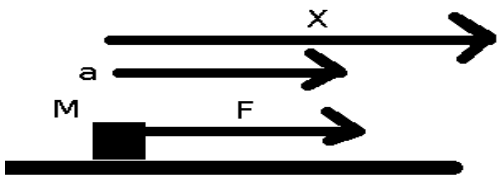
The test score is then determined by

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

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.

Solution:



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

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: $x=\frac{F}{2\mathrm{M}}t^2$

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

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

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

Physics Lab Grading Rubric Spring 2023

Note: Each student has the opportunity to revise deficient portions of the lab report during the lab period except for teamwork, arrival and departure.

	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 iand how results relate to hypothesis	poor of 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

Notes on the lab write-up for physics labs Spring 2023

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 or in previous labs) 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.

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.

Safety regulations for General Physics Labs SP2023

(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.
(6) In accord with the Lyon mask requirement, you must wear an appropriate mask at all times in the lab. Cover your keyboard with the wrap provided, use your mouse with cover provided. At the end of the lab period, remove and discard these coverings.

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 FA2021

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 Phy241,Phy251 will be evaluated for **1** selected labs with rubric data recorded. Since students are allowed to submit revised reports, the initial submission will normally serve as the indicator since students are given the opportunity to revise submission based upon my comments. Portions related to 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 completed 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 calculations partially enabled by spreadsheet examples and being able to interpret the results. This is evidenced by the 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 for 3 selected labs. Information literacy is regularly evaluated in 241/251 and is evidenced by correct physical 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.

Student Learning Outcomes for the Physics Program at Lyon College RSP2017

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 currently-used standard exams and exam problems.

General Education learning outcomes for Phy220/Phy250/Phy251

Critical thinking: 220,250,251
Inquiry and analysis: 251
Quantitative literacy: 220,250,251
Teamwork: 251
Scientific thought and Information literacy: 220,250,251

Portions related to Phy251 will be evaluated for **2** selected labs with rubric data recorded. Since students are allowed to submit revised reports, the initial submission will normally serve as the indicator since students are given the opportunity to revise submission based upon my comments. Portions related to 220/250 rubric will have data recorded for 4 selected problems; one from each exam.

Critical thinking is regularly evaluated in phy220, phy250 and phy251. In Phy220 and Phy250 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 Phy251, 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 phy251 as part of the required element of completed 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 phy220 and phy250 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 phy251 by students being able to follow through with calculations partially enabled by spreadsheet examples and being able to interpret the results. This is evidenced by the writeup and is a required element by the rubric.

Teamwork is regularly evaluated in phy251 and is evidenced by successful team completion of lab writeups as is required by the rubric.

Scientific thought and information literacy is regularly evaluated in phy251 and is evidenced by use of hypothesis with supporting evidence (or not supporting evidence) based upon experiment as is required by the lab rubric for 3 selected labs. Information literacy is regularly evaluated in phy251 and is evidenced by correct physical terminology in lab reports as required by the lab rubric. It is also a significant portion of phy220 and phy250 and is evidenced by student success in using the basic physical terminology enabling students to correctly initiate quantitative solutions to physical situations.