

Lyon College Course Syllabus

Course Number and Section: phy240.01

Course Title: Fundamentals of Physics I

Course Meeting Days/Times: MWF 8-8:50

Semester FALL

Year: 2020

Professor's Information

Name: Stuart Hutton

Office Location: Derby 248

Office Hours:

MWF 10-10:50

E-mail Address: Stuart.Hutton@lyon.edu

Phone Number: 870-307-7560

STANDARD POLICIES

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 Students who are administratively withdrawn from more than one course will be placed on probation or suspended.

Disabilities

If a student has a disability that qualifies under the American with Disabilities Act (ADA) and requires accommodations, they should contact the Office of Disability Services in the Morrow Academic Center for information on appropriate policies and procedures. Disabilities covered by ADA may include learning, psychiatric, physical disabilities, and/or chronic health disorders. Students can contact Office of Disability Services if they are not certain whether a medical condition/disability qualifies.

Location: Morrow Academic Center

Staff: Danell Hetrick, Director of Academic Support

Email: danell.hetrick@lyon.edu

Telephone: 870-307-7021

Harassment, Discrimination, and Sexual Misconduct

Title IX and Lyon's policy prohibit harassment, discrimination and sexual misconduct. Lyon encourages anyone experiencing harassment, discrimination or sexual misconduct to talk to Dr. Patrick Mulick, Dean of Students and Title IX Coordinator, about what happened so they can get the support they need and Lyon can respond appropriately. Lyon is legally obligated to respond to reports of sexual misconduct, and therefore we cannot guarantee the confidentiality of a report, unless made to a confidential resource (Chaplain, Counselor, or Nurse). As a faculty member, I am required to report incidents of sexual misconduct and thus cannot guarantee confidentiality. I must provide our Title IX coordinator with relevant details such as the names of those involved in the incident.

Tentative Syllabus for Physics 240: Fall 2020

Professor: Dr. Stuart Hutton

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SMS: 307.***.8765 /lab email: lyonphysics@<*.com> web: physics.lyon.edu
Phone: ***.307.7560 Email: stuart.hutton@lyon.edu**

During tests: Our tests will be done online. During this time you are forbidden to communicate with others except for me through the class google meet link. You are required to be present during the specified times for the tests.

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

In this course, you will have several grading opportunities, tests, and in-class problems. I expect active participation in our class. The various weight of each of these activities in your final point grade is shown below. Late assignments will normally not be accepted. Additionally, since we will be doing in-class problems, poor attendance will negatively affect your grade: in particular, you will not receive credit for class participation for unexcused absences. There are no make-ups for in-class worksheets.

Tests (3 tests and 1 [comprehensive] final exam)=90%

Each test is worth 22.5% of your grade.

Homework / in-class problems/ class participation=10%

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.

Your work on tests will be graded for correctness. Due to the unusual nature of this fall semester, the tests will be multiple choice and online. You are expected to become proficient with physical quantities and units in addition to being able to do the physics leading to the solution of problems. You are expected to each day come prepared for class. This is accomplished by having looked over the worksheet before class, and then working the problems for complete understanding after class. Students are generally expected to commit two hours of study outside of class for each hour of lecture. You will also notice that before each of the 4 tests, I have scheduled an Untest. On this day, you should come prepared to work as if this were the actual test. The format of the untests is not multiple choice. Instead you are expected to work through the problems as if it were an actual test. I have also scheduled several Unquizzes. Time permitting, we will allow about 10 minutes for you to complete self-diagnostic Unquizzes. During unquizzes and untests, you are encouraged to ask questions and discuss approaches to the solutions.

Course Description: Physics 240

In this course you will be exposed to fundamentals of physics. Among the topics that we will cover are mechanics, waves and thermodynamics. Refer to Student Learning Outcomes for a discussion of minimal course outcome expectations.

Course Objectives: Physics 240

As a consequence of this course, you should obtain an enhanced understanding of the fundamentals of physics. In addition, you should come away from this course with an ability to solve fundamental problems involving physical principles.

Course Prerequisites: Physics 240

You are expected to be proficient with algebra and trigonometry. It is strongly recommended that your life will be made easier if you review trigonometry. Additionally you must satisfy the calculus prerequisites for physics 240. Phy241 is a concurrent requirement.

Text: Physics 240

The textbook in this course is:
Principles of Physics, Serway and Jewett, Fourth edition

ISBN: 0-534-49143-X

You may use earlier editions of this text (which can be obtained at much lower prices online {\$0.25 for example is a low price}) but you will need to be sure to read the correct portions of the text.

The schedule is designed around this particular text edition. Again, you may use earlier or later editions but you will need to be sure to read the correct portions of the text. The text must be considered to be a very important resource so students are expected to be reading along in the text as the course progresses.

Punctual and complete class attendance is expected. Absences will negatively impact your final grade. Attendance will be taken. If you must miss class, you will need to watch the lecture recording and let me know that you have done this within a day of the actual lecture. You should use asynchronous attendance sparingly. An event such as a thunderstorm at my house or internet difficulties may mean that I will need to provide the lecture during these events in an asynchronous manner.

Academic Honesty

It is expected and encouraged that students in this class will work together on homework problems. If you use reference work, be sure to include proper references. Questions during tests should be directed to the professor only and students are not permitted to communicate with each other during tests. Students are specifically prohibited from discussing any aspect of tests until all students have completed the test in both phy240 and phy210. Contravention of these conditions will be considered to be a violation of the Lyon College Honor Code.

CLASS SCHEDULE / OFFICE HOURS Fall 2020

Pandemic Version

Professor: Stuart Hutton

Monday	Tuesday	Wednesday	Thursday	Friday
8:00-8:50 PHY240.01 Fundamentals of Physics I	8:00-9:15	8:00-8:50 PHY240.01 Fundamentals of Physics I	8:00-9:15	8:00-8:50 PHY240.01 Fundamentals of Physics I
9:00-9:50 PHY210.01 General Physics 1	9:30-10:00	9:00-9:50 PHY210.01 General Physics 1 Derby 011	9:30-10:00	9:00-9:50 PHY210.01 General Physics 1
10:10-10:50 Office Hours	10:00 - 10:50	10:10-10:50 Office Hours	10:00 - 10:50	10:10-10:50 Office Hours
11:00-11:50 PHY335.01 Modern Physics	11:00-11:50 Lunch	11:00-11:50 PHY335.01 Modern Physics	11:00-11:50 Lunch	11:00-11:50 PHY335.01 Modern Physics
12:00-12:50	12:00-12:50	12:00 - 12:50	12:00 - 12:50	12:00 - 12:50 SGA
13:00-13:30 Phy390.01DS Physics Seminar	13:00-14:50	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
	4-4:50 FRC			

Pandemic Schedule for Phy210, Phy240, and Phy241: Fall 2020: Revision 0

labs	Worksheet Number	Date	210: Cutnell: 8th ed. Assignment Reading : Homework	240: Serway 4th ed Assignment: Reading: homework
	Class Initialization	W August 19	Chapter 01: Units, vectors, math and trig	Chapter 01 Introduction and Vectors
RF Lab 00: intro lab	Worksheet 01 units trig	F August 21	Chapter 01:H01	Chapter 01:H01
	Worksheet 02 1d motion	M August 24	Chapter 02:H02: 1d motion	Chapter 02:H02 1d motion
	Worksheet 03 free fall	W August 26	Chapter 02:H03	Chapter 02:H03
RF Lab 01: Forces & Vectors	Worksheet 04 2d motion1	F August 28 UQ01	Chapter 03:H04: 2d motion	Chapter 03:H04: 2d motion
	Worksheet 05 2d motion2	M August 31	Chapter 03:H05	Chapter 03:H05
	Worksheet 05 2d motion2	W September 02	Chapter 03:H05	Chapter 03:H05
RF Lab 02: 1 and 2 D motion	Worksheet 06 force1, fbd	F September 04 UQ02	Chapter 04:H06: Forces, fbd	Chapter 04:H06 Forces, fbd
	Worksheet 07 force 2, fbd	M September 07	Chapter 04:H07	Chapter 04:H07
	UnTest#1	W September 09	Chapter 04	
RF Lab 03: Planes & Friction	Test 1: coverage: ws01-ws07	F September 11		
	Worksheet 08 inclined plane	M September 14	Chapter 06:H08: work and energy	Chapter 06:H08 Energy and Energy Transfer
	Worksheet 09 inclined 2	W September 16	Chapter 06: H09	Chapter 07:H09 Potential Energy
RF Lab 04: Atwood's, mechanical advantage, work & Energy	Worksheet 10 energy 2	F September 18 UQ03	Chapter 07:H10: impulse, momentum	Chapter 08:H10 Momentum and Collisions
	Worksheet 11 spring energy	M September 21	Chapter 07: H11	Chapter 08:H11
	Worksheet 12 collisions1	W September 23	Chapter 05:H12: Uniform Circular Motion	Chapter 10:H12 Rotational Motion
RF Lab 05: Centripetal Force & Hooke's Law	Worksheet 13 collisions2	F September 25 UQ04	Chapter 08:H13: Rotational kinematics	Chapter 10:H13
	Worksheet 14 ucm 1	M September 28	Chapter 08: H14	Chapter 10:H14
	Worksheet 15 acc frames	W September 30	Chapter 09:H15: Rotational dynamics	Chapter 10:H15
RF: No Lab	Worksheet 16 non ucm	F October 02 UQ05	Chapter 09: H16	Chapter 10:H16
	UnTest#2	M October 05		
	Test 2: coverage: ws08-ws16	W October 07		
RF Lab 06: Static Equilibrium	Worksheet 17: Rotate2 energy	F October 09	Chapter 09: H17	Chapter 10:H17
	Worksheet 18 Torque, L	M October 12	Chapter 09: H18	Chapter 10:H18
	Service Day	W October 14		
RF Lab 07: Simple Harmonic Oscillation	Worksheet 19 statics	F October 16 UQ06	Chapter 10: H19 Simple Harmonic Oscillation	Chapter 12:H19 Oscillatory Motion
	Worksheet 20 osc1:spring	M October 19	Chapter 10: H20	Chapter 12:H20
	Worksheet 21 osc2:pendulum	W October 21	Chapter 10: H21	Chapter 12:H21
RF Lab 08: Standing Waves and Vibrations	Worksheet 22 string waves1	F October 23 UQ07	Chapter 16:H22 waves and sound	Chapter 13:H22 Mechanical Waves
	Worksheet 23:string waves2	M October 26	Chapter 16:H23	Chapter 13:H23
	Worksheet 24 sound waves	W October 28	Chapter 17:H24: wave superposition	Chapter 14:H24 :Superposition and Standing Waves
RF Lab09: Archimedes' Principle & Pressure	Worksheet 25 beats, Doppler	F October 30	Chapter 17: H25	Chapter 14:H25
	UnTest 3	M November 02		
Test 2: coverage: ws08-ws016	Test 3: coverage: ws19-ws25	W November 04		
RF Lab 10: Thermodynamics	Worksheet 27 therm 01	F November 06	Chapter 12: Temperature and Heat	Chapter 16: Temperature and the kinetic theory of gasses
	Worksheet 28 therm 02	M November 09	Chapter 13:H27: transfer of heat	Chapter 16:H27
	Worksheet 29 therm 03	W November 11	Chapter 14:H28: 1DG and kinetic theory	Chapter 17: H28:Energy in Thermal Processes: 1 st law of thermo
	Second Service Day	R November 12		
RF: No Lab	Worksheet 30 therm 04	F November 13 UQ08	Chapter 15::H29: thermodynamics	Chapter 18: H29: Heat Engines, Entropy, and the 2 nd law of thermo
	Worksheet 30 (continued)	M November 16	Chapter 15: H30	Chapter 18:H30
	Worksheet 26 Archimedes Worksheet 31 Fluids 1	W November 18	Chapter 11: H31: Fluids Chapter 17:H26	Chapter 15: H26:Fluid Mechanics :Sections 15.1 – 15.4 Chapter 16: H31:Fluid Mechanics: Sections 15.5-15.9
RF: No Lab	UnTest 4: coverage: ws27-ws31	F November 20		
	Last day of classes	F November 20		
	Final Exams	November 21 - November 24		\

Physics Problem Solving Rubric Rev Fall 2020

	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:

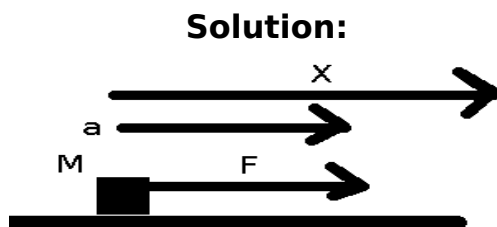
$$P_i = \frac{\text{total number of points from rubric}}{\text{maximum rubric points per problem}} \times \frac{100}{\# \text{ of problems on test (normally 4)}}$$

The test score is then determined by

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

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 .



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

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

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

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

Student Learning Outcomes for the Physics Program at Lyon College Fall 2020

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 Phy210/Phy240/Phy241

Critical thinking: 210,240,241

Inquiry and analysis: 241

Quantitative literacy: 210,240,241

Teamwork: 241

Scientific thought and Information literacy: 210,240,241

Portions related to Phy241 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 210/240 rubric will have data recorded for 4 selected problems; one from each exam.

Critical thinking is regularly evaluated in phy210, phy240 and phy241. In Phy210 and Phy240 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 phy241, 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 phy241 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 phy210 and phy240 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 phy241 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 phy241 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 phy241 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 phy241 and is evidenced by correct physical terminology in lab reports as required by the lab rubric. It is also a significant portion of phy210 and phy240 and is evidenced by student success in using the basic physical terminology enabling students to correctly initiate quantitative solutions to physical situations.