Course Title/Number	**General Physics I Laboratory / PHY 202**
Semester/Year	Fall 2014
Days/Time	PHY 202-108 (CRN: 3806): T, 4:00-5:50 pm PHY 202-109 (CRN: 3807): R, 4:00-5:50 pm
Location	Science Building Room 100
Instructor	Dr. Howard L. Richards
Office	Science Building Room 105
Phone	304-696-6466 / Fax: 304-696-2494
E-Mail	Howard.Richards@Marshall.edu
Office/Hours	<table><tr><th></th><th>Monday</th><th>Tuesday</th><th>Wednesday</th><th>Thursday</th><th>Friday</th></tr><tr><td>12</td><td>PS 109</td><td rowspan="3"></td><td>PS 109</td><td rowspan="3"></td><td>PS 109</td></tr><tr><td>1</td><td rowspan="3">Office Hours</td><td rowspan="3">Office Hours</td><td rowspan="3">Office Hours</td></tr><tr><td>2</td></tr><tr><td>3</td><td>Office Hours</td><td>Office Hours</td></tr><tr><td>4</td><td rowspan="3"></td><td rowspan="2">PHY 202</td><td rowspan="3"></td><td rowspan="2">PHY 202</td><td></td></tr><tr><td>5</td><td rowspan="2">PHY 204</td></tr><tr><td>6</td><td>PHY 201</td><td>PHY 201</td></tr></table>Also by appointment.
University Policies	By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy be going to www.marshall.edu/academic-affairs and clicking on “Marshall University Policies.” Or, you can access the policies directly by going to http://www.marshall.edu/academic-affairs/?page_id=802 Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment

Course Description: From Catalog

Required of all students taking PHY 201 or PHY 211, unless exempt by special permission. 2 hrs. lab (CR: PHY 201 or PHY 211).

The table below shows the following relationships: How each student learning outcomes will be practiced and assessed in the course.

Students will …	Practiced by	Assessed by
Perform experiments related to mechanics and thermal physics; collect the generated data	(1) following along with the demos, examples, and explanations in the pre-lab lecture; (2) working steadily through the lab, so there is time to correct mistakes; (3) the difficulty and expectations for labs increase as students gain experience.	Lab Reports and Exam Questions.
Identify and, where possible, minimize the sources of experimental uncertainty.		
Employ the methods of error propagation to determine the magnitude of uncertainty in derived quantities from the uncertainty inherent in experimental measurements.		
Use basic algebra to calculate physical quantities from experimental measurements.		
Compare two quantities which should be identical, and at least one of which is either a direct experimental measurement or is calculated from experimental measurements, and argue convincingly whether the agreement is good enough to support the theory.		Lab Reports.

Required Texts, Additional Reading, and Other Materials

1. *Physics 202 Laboratory Manual*, by Elwyn Bellis.
2. Recommended: *College Physics* by Urone, Hinrichs, Dirks, and Sharma, free in electronic form at http://openstaxcollege.org/textbooks/college-physics

Course Requirements / Due Dates

1. Lab reports / Due at the beginning of the next lab meeting
2. Exam 1 / June 26
3. Exam 2 / July 10

Grading Policy

60% Laboratory Report Average	**A = 90+**
	B = 80-90^{-}
20% Exam 1	**C = 70-80^{-}**
20% Exam 2	**D = 60-70^{-}**

Students who fail both exams will fail the class. This is departmental policy.

Attendance Policy

Students are expected to be on-time and present for all lab meetings. An attendance record will be maintained, with possible entries of **P**resent, **E**xcused, and **A**bsent.

Students with excused absences may make up missed labs at no penalty, but students with unexcused absences will have 3 points deducted because their lab reports will be "very late". If a student cannot attend a lab, he or she should obtain an excused absence, contact the instructor, and try to attend a different section. If it is impossible to attend a different section, the student should email Lab Coordinator David Sheehan at sheehand@marshall.edu and arrange to make up the lab before noon on the next Monday.

Policy for Students with Disabilities:

Marshall University is committed to equal opportunity in education for all students, including those with physical, learning and psychological disabilities. University policy states that it is the responsibility of students with disabilities to contact the Office of Disabled Student Services (DSS) in Prichard Hall 117, phone **304-696-2271**, to provide documentation of their disabilities. Following this, the DSS Coordinator will send a letter to each of the student's instructors outlining the academic accommodation he/she will need to ensure equality in classroom experiences, outside assignment, testing and grading. The instructor and student will meet to discuss how the accommodation(s) requested will be provided. For more information, please visit http://www.marshall.edu/disabled or contact Disabled Student Services Office at Prichard Hall 11, phone **304-696-2271**.

Students with Medical Conditions:

In addition to the above, students with medical conditions, temporary or permanent, that may require special attention or accommodation (such as epilepsy) should inform the instructor as soon as possible.

Your privacy will be respected.

Course Schedule

Lab #	Week of …	Description	Compare	
1	08/25/14	Intro to Motion	Velocity from stopwatch measurement	Velocity from sensor measurement
2	09/01/14	Accelerated Motion	Average acceleration (Activity 1-1)	Instantaneous acceleration (Activity 1-3)
3	09/08/14	Mathematical Description	Acceleration from *v* vs *t*	Acceleration from *x* vs *t*
			Initial velocity from *v* vs *t*	Initial velocity from *x* vs *t*
4	09/15/14	Projectile Motion	Measured range	Calculated range
5	09/22/14	Force and Motion	Mass of cart from graph	Mass of cart from scales
			Force of friction moving toward sensor	Force of friction moving away from sensor
6	09/29/14	Circular Motion	Measured centripetal force	Calculated centripetal force
7	10/06/14	Work and Energy	Measured net work	Measured change in kinetic energy
			Total mechanical energy at lowest point on track	Total mechanical energy at highest point on track
8	10/13/14	Collisions	Impulse	Change in momentum
Exam 1	**10/20/14**	**Covers Labs 1 – 6**		
9	10/27/14	Simple Harmonic Motion	Spring constant from Force vs Displacement	Spring constant from period of oscillation
Last Day to Drop 1 Course			**Friday, October 31, 2014**	
10	11/03/14	Periodic Motion of a Pendulum	Measured acceleration due to gravity (g)	Accepted g = 9.8 m/s^2
11	11/10/14	Longitudinal Waves and Sound	Measured speed of sound at various frequencies	Speeds should be consistent with each other and ~343 m/s
12	11/17/14	Temperature and Heat	Measured equilibrium temperatures	Calculated equilibrium temperatures
			Measured specific heat capacity of aluminum	Accepted specific heat capacity of aluminum
	11/24/14	**Thanksgiving Break**		
	12/01/14	**Semana de Muertos**		
Exam 2	**12/08/14**	**4-5:50**	**(Regular Class Time)**	**Covers Labs 7 – 12**

Advice for Succeeding in Lab

Before You Come to Lab:

- Finish the lab report you will be turning in. Lab reports are due **at the beginning of the lab period**. Do not wait until then to finish your write-up or worry about printing out your conclusion: a lab report that is submitted more than ten minutes after the official start of the lab will be marked late and **1 point** will be deducted. A lab report that is submitted after **1 p.m.** will (except in cases of excused absences) be marked very late and have **3 points** deducted.
- Read the section of the lab manual covering the experiment you are about to do.
- Find the corresponding material in your PHY 201 or PHY 211 textbook and read that, too. This will give you a better understanding of what the lab will be about.
- If students are not finishing labs, it is probably due to lack of preparation, and the instructor reserves the right to give a short (~5 minute) quiz at the beginning of any lab to test whether students are reading the lab manual. If the quiz is given, it will count for 25% of the lab report grade for that lab.

At the Start of Lab:

- Turn in your lab report from the previous meeting! Please staple the pages together, including your conclusion.
- If the computer is needed for the lab (as is usually the case), go ahead and log in. It takes the computer a few minutes to load all the software.
- **Make sure you know the full names of your lab partners.** It might be a good idea to get their email addresses or phone numbers, too, in case you realize later you are unclear on how something was done. Write your lab partner's full names on the front page of your lab report.
- Speaking of lab partners, each student should have at least one partner and no more than three, with two being the ideal. (When there is a problem with the equipment, **the instructor** may combine two groups, but this is exceptional.)
- For the most part, you may choose whatever partners yourselves. However, if necessary the lab instructor may break up or shuffle a team. This may happen because the team is goofing off or if everyone at the table seems to have too much difficulty understanding the material, in which case they would all benefit from being teamed with students who have a knack for physics lab. Please do not take offense if your team is split up.
- The instructor will usually give a brief overview of the experiment. Pay attention and take notes during this period of time; you should not be chatting or playing on the computer (games, emails, or social media). Above all, show respect to the instructor and the other students by not becoming a distraction. These rules also apply whenever the instructor addresses the class.

During the Lab:

- **Work safely.** Obey the safety instructions from the overview, and if something seems dangerous or you are not sure about it, ask!
- Work steadily. These labs can be finished in the time allotted, but not if you waste time.
- Take turns in the different experimental roles so that everyone understands the experiment. Everyone should be involved; freeloading is not allowed!
- Once you have completed your measurements, make sure to actually calculate the two things that must be compared (see the lab schedule for details). If the disagreement is large, you might need to check your methods and repeat some measurements.
- Do as much of the lab as time permits, including answering homework questions. It will be easier to answer questions when the lab is fresh in your mind and your partners are all together.
- Before you leave, show your work to the instructor. The first page of your lab report must be initialed by the instructor before you leave.
- Concentrate on making the measurements. There may be questions that ask for a few sentences or a paragraph of explanation. Unless you can answer them quickly, leave those for later; if necessary, you can finish that at home. On the other hand, you only have access to the experimental equipment during the lab period.

Writing Your Lab Report:

- The bulk of the report consists of pages you take from the lab manual. Each student is responsible for his or her own lab report, which should include all data and graphs.
- **Do** use the same data as your lab partners. **Do** help each other understand how to answer questions. **Do not** simply copy your partners' answers. **Do** write explanations in your own words. **Do not** copy answers from labs from previous semesters.
- Remember to show your work on at least one example of each kind of calculation.
- Each lab report must also include a typewritten conclusion consisting of two paragraphs. Handwritten conclusions will not be accepted. This part of your report is very important to your grade.
    - The first paragraph should be about **what the experiment was trying to do.**
        - THIS IS ABOUT THE GOALS OF THE EXPERIMENT AND WHETHER THEY WERE MET. DO NOT MERELY RESTATE THE PROCEDURE.
        - Consider the main comparison you are asked to make (again, see the schedule). Does this comparison test a principle, like the conservation of energy or the conservation of momentum? Does it test an assumption, like the idea that the x- and y-components of motion are independent for projectile motion, or that the average velocity and instantaneous velocity should be the same in a constant-velocity experiment? Then this is what the lab is about; say so and say why in your first paragraph.
        - Also include in your first paragraph an explanation of what you measured and what you calculated to make the comparison. List the equation numbers.
        - How good is the agreement? Does your experiment support the idea that energy is conserved, or whatever?
        - If there is disagreement, can you account for it in terms of the experimental error (discussed in the second paragraph)?

- The second paragraph should be about **experimental error.**
  - **EXPERIMENTAL ERROR IS NOT SLOPPINESS OR CARELESSNESS. IT IS THE UNAVOIDABLE UNCERTAINTY INHERENT IN THE EXPERIMENT.** For example, experimental error can be due to human reaction time when operating a stopwatch, the limited precision of a protractor for measuring angles, a track that is not level, a spring launcher that is not perfectly consistent, etc. Pay attention in the overview for help with this.
  - Identify the sources of error for your measurements.
  - If you can, give a quantitative estimate for the uncertainty in your measurement.
  - If you can, use error propagation to give a quantitative estimate for the uncertainty in your calculated quantities.

Each lab report will be graded on a 10 point maximum basis. **The completed reports are to be stapled and turned in at the immediate beginning of the next lab class. A**n unexcused absence results in a zero for the that lab. **The lowest lab report will be dropped from the average.**

For Additional Help:

- If you find yourself struggling, **let the instructor know**. Feel free to drop by during office hours – that's what they are there for!
- It may also be a good idea to study with other students taking the same course.
- A very good online tutorial for intro physics can be found at the HyperPhysics web page: http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.htm.
- The Physics Department has a page of tutorial links, including "in house" tutoring at http://www.marshall.edu/physics/tutoring.asp.
- There is also a tutoring center in Laidley Hall. See http://www.marshall.edu/wpmu/uc/tutoring-services/ for details.
- Finally, a number of helpful explanations can be found at http://www.nagt.org/nagt/jge/columns/compgeo.html. That site is targeted at computational geology, but many of the ideas apply directly to physics.

Other Lab Sections:

Section	Meets	Instructor
101	T 8:00-9:50	Maria Babiuc-Hamilton (babiuc@marshall.edu)
102	T 10:00-11:50	Wesley Shanholtzer (shanholw@marshall.edu)
103	T 1:00-2:50	
104	W 8:00-9:50	Thomas Wilson (wilsont@marshall.edu)
105	R 8:00-9:50	Maria Babiuc-Hamilton (babiuc@marshall.edu)
106	R 10:00-11:50	Huong Nguyen (nguyenh@marshall.edu)
107	R 1:00-2:50	Wesley Shanholtzer (shanholw@marshall.edu)

Classroom Behavior:

Disorderly conduct that interferes with the normal classroom atmosphere will not be tolerated. The classroom instructor is the judge of such behavior and may instruct a disorderly student to leave the room with an unexcused absence. More serious misconduct may result in a complaint to the Office of Judicial Affairs. "Official University action will be taken when a student's or student group's behavior violates community standards, interferes either with the University's educational purpose, or with its duty to protect and preserve individual health, welfare, and property. When the behavior is aggravated or presents a continuing danger to the University community, accused students are subject to separation from the institution."[1]

Academic Dishonesty:

"Academic Dishonesty is something that will not be tolerated as these actions are fundamentally opposed to 'assuring the integrity of the curriculum through the maintenance of rigorous standards and high expectations for student learning and performance' as described in Marshall University's Statement of Philosophy."[2] Cheating and other forms of academic dishonesty will bring serious sanctions, including possible expulsion. **Cheating on an exam will result at minimum in failing the entire course.** You are encouraged to cooperate on the portion of the report covering in-lab activities, but **do your own work on the homework part of the report**.

1 *Student Handbook*, available at www.marshall.edu/student-affairs/sections/handbook/INDEX.HTML
2 Ibid.