

Course Title/Number	Conceptual Physics Laboratory / PHY 101L					
Semester/Year	Spring 2017					
Days/Time	PHY 101L-201 (CRN: 4800): Tuesday, 11:00 am – 12:50 pm					
Location	Science Building Room 103					
Instructor	Dr. Howard L. Richards					
Office	Science Building Room 105					
Phone	304-696-6466 / Fax: 304-696-2494					
E-Mail	RichardsH@Marshall.edu					
Office/Hours		Monday	Tuesday	Wednesday	Thursday	Friday
	09:00		PS 122-201		PS 122-201	
	09:30					
	10:00		PHY 101L-201	Office Hours	Office Hours	Office Hours
	10:30					
	11:00					
	11:30	PHY 203-202	PHY 203-202	Lunch	PHY 203-202	
	12:00					
	12:30					
	01:00	Office Hours		Lunch	Office Hours	
	01:30					
	02:00		PHY 203-203	Office Hours	PHY 203-203	
	02:30					
	03:00					
	03:30					
	04:00					
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					
Consumer Information and Disclosures	To assist in locating federally mandated consumer information and disclosures, Marshall University has created a launching point at http://www.marshall.edu/disclosures/ . Reports and information on a variety of specific areas, including financial aid, student privacy, student body diversity, the drug and alcohol abuse prevention program, employment and further education statistics for graduates, refund policies, and campus safety, are available from this website.					

Course Description: From Catalog**Conceptual Physics Lab. 1 hr. I, II, S.**

A laboratory course designed to include the principles and applications of physics that are introduced in Physics 101. (CR: PHY 101) 2 lab.

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 conceptual physics and 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 enough time to correct mistakes; (3) the difficulty and expectations for the labs increase as students gain experience.	Lab Reports and Exam Questions.
Identify and, where possible, minimize the sources of experimental uncertainty.		
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 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. *PHY 101L Lab Manual*, available in the bookstore.
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 END OF EACH LAB!
2. Exam 1 / February 28
3. Exam 2 / April 25

Grading Policy

50% Laboratory Report Average	A = 90+
	B = 80-90-
25% Exam 1	C = 70-80-
25% Exam 2	D = 60-70-
<u>Students who fail both exams will fail the class. This is departmental policy.</u>	

Students are expected to be on-time and present for all lab meetings.

Make-up labs are scheduled at the instructor's convenience, usually just before a test. 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.

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.

Attendance Policy:

Students are expected to be present and on time for all lab meetings. Students who are excessively late, so that they miss the majority of the experiment, are not allowed to complete the lab using data generated by their lab partners. Students who must miss for serious reasons are strongly encouraged to seek a university excused absence. Please be aware that this will require some documentation (often a doctor's note). Students without an excused absence may make up the lab, but will suffer a deduction of 3 points (30%) from the lab report. Make-up labs are at the instructor's convenience, usually just before an exam.

Course Schedule:

Mon, Jan 9, 17	First day of classes
Tue, Jan 10, 17	Lab 1: Statistical Fluctuations [Background Radiation]
Fri, Jan 13, 17	Last day to add a class
Tue, Jan 17, 17	Lab 2: Velocity and Acceleration [Inclined Plane]
Tue, Jan 24, 17	Lab 3: Measurement of “g” [Free Fall]
Tue, Jan 31, 17	Lab 4: Simple Harmonic Motion [Simple Pendulum]
Tue, Feb 7, 17	Lab 5: Conservation of Momentum
Tue, Feb 14, 17	Lab 6: Wave Motion [Vibrating String]
Tue, Feb 21, 17	Lab 7: Velocity of Sound [Resonance Column]
Tue, Feb 28, 17	Midterm Exam: Labs 1-6
Tue, Mar 7, 17	Lab 8: Ohm's Law and Simple Circuits
Tue, Mar 14, 17	Lab 9: Magnetic Fields
Fri, Mar 17, 17	Last day to drop a full semester course
Mar 20 – Mar 25	Frühlingsferien
Tue, Mar 28, 17	Lab 10: The Simple Lens
Tue, Apr 4, 17	Lab 11: Spread of a Laser Beam
Tue, Apr 11, 17	Lab 12: Measurement of Wavelength [Laser]
Tue, Apr 18, 17	Review
Tue, Apr 25, 17	Final Exam: Labs 7-12
Fri, Apr 28, 17	Last day to completely withdraw

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.”¹ 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.**

Students are not allowed to use data they had no part in collecting.

¹ Ibid.

Advice for Succeeding in Lab**Before You Come to Lab:**

- Read the handout covering the experiment you are about to do.
- Find the corresponding material in your PHY 101L textbook and read that, too. This will give you a better understanding of what the lab will be about.

At the Start of Lab:

- **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, or for certain experiments, **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 your phone (games, texts, 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. If the disagreement is large, you might need to check your methods and repeat some measurements.
- Write up your lab reports, as described below, and turn it in.

Writing Your Lab Report:

- Part of the report consists of pages you take from the handout. Each student is responsible for his or her own lab report, which should include all data and graphs. Include these pages at the front of your lab report. Remember to put your name and the name of your lab partners on the front.
- **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.

- Your handout already spells out the procedure and usually contains a drawing or schematic of your experimental setup. You only need to write a “procedure” section if you deviate from what is described in the handout or if the description in it is incomplete. Add an additional sketch of the experimental setup if it is needed for clarity.
- One of the most important parts of your lab report is the “Objective” section, which is 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. Does this comparison test a principle, like the conservation of energy or the conservation of momentum? Does it test an assumption, like the “theoretical” value for the acceleration due to gravity? Then this is what the lab is about; say so and say why in your first paragraph.
 - Also include in your Objective an explanation of what you measured and what you calculated to make the comparison. List the equation numbers. Again, this is not about the details of how you make the measurement; it is more about what you measure.
- Another important part of your report is the “Error Analysis”.
 - **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 – for example, friction.
 - You will usually need to calculate a quantitative measurement of the error – either the “percent error”, if the comparison is with a known value, or the “percent difference”, if you are comparing two experimental measurements.
- Finally, you need to write a “Conclusion”. This is where you state what was learned in the lab – that is, did you achieve the goals specified in the Objective? **Think of the lab as an episode of *Mythbusters*.** The myth is that the theory, as presented in your textbook and lab manual, is correct. Is the myth busted, plausible, or confirmed? (It should be confirmed!)
 - How good is the agreement? Does your experiment support the idea that energy is conserved, or whatever the Objective was trying to establish?
 - If there is disagreement, can you account for it in terms of known sources of experimental error?

Each lab report will be graded on a 10 point maximum basis. **The completed reports are to be stapled and turned in at the end of the lab.** An unexcused absence results in a zero for the that lab if the lab cannot be made up by attending the other section. **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/>.
- The Physics Department has a page of tutorial links at <http://www.marshall.edu/physics/tutoring-resources/>.
- 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.

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."²

You may not use your phone as a calculator during tests, nor any other tablet or device capable of sending or receiving text, emails, video, or phone messages. You can get a very good scientific calculator (e.g., Casio *fx-300ES PLUS*) for less than \$20; I recommend choosing one with two-line display (so you can check for typos in your input) and at least 3 memory locations (usually named A, B, C, ...) in which you can store intermediate results to avoid rounding error. Of course, if some other department required you to buy an unnecessarily expensive graphing calculator, you can use that, too.

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