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### PHSX 216N.03: Physics Laboratory I with Calculus

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## Course Information

- Instructor Name: Dr. Alex Bulmahn
- Office: CHCB 226
- Email: alexander.bulmahn@umontana.edu
- Lab: Wednesday 3:00-4:50pm in CHCB 229
- Office Hours: MW 1:30-2:30, T 10:30-11:30. Please feel free to email me and make an appointment for other times.
- Website: [Moodle](http://umonline.umt.edu) umonline.umt.edu

## Overview

The goal of this class is to give you a sound introduction to classical experimental physics. This will include studying some basic concepts in physics, development of problem solving skills, learning of laboratory techniques and some basic programming skills for data analysis. It is essential that you keep up from the start as the concepts in this course build on each other. Co-requisite to this course is PHSX 215.

## Learning Objectives

The goals of this course are:

- To learn how to properly take measurements and record data.
- To learn how to interpret results both statistically and graphically.
- To experimentally confirm theories presented in lecture.

## Laboratory

There will be 12 two-hour labs during the semester. Eleven of those labs will count towards your final grade. You will be required to attend the labs, take measurements, and then write up a report and take a quiz for each lab. Each student must hand in their own lab report written in their own words. If you miss a lab, you may not attempt the quiz.

In preparation for the course, you should go to the course Moodle page to download the document, "Treatment of Data", which explains how to handle error analysis, graphing, and other key issues that come up while writing labs. Each week, a few days before your lab, you should read the current lab. Students are expected to have read the instructions prior to arriving at the lab, and will be asked to take a brief pre-lab quiz on Moodle.

There will be no make-up labs. If you will miss your lab, contact your instructor *ahead of time* about attending another section that week. Labs are held Mon, Tues, Wed 3:00-4:50pm.

## Lab Report and Quiz due dates

- Pre Lab Quizzes: On Moodle, open on Thursday at 8am and close at 11:59pm the day before your lab section. 60 minutes allowed to take quiz.
- Lab Quizzes: On Moodle, open on Thursday at 8am and close on Monday at 1pm for all sections. 30 minutes allowed to take quiz.
- Lab Reports: Due at beginning of the following lab meeting.
- Late Penalties for Lab Reports: Late lab reports will be penalized 10% per day late, excluding holidays and weekends. Labs will not be accepted more than one week after their due date.

## Course Guidelines and Policies

### Student Conduct Code

The Student Conduct Code at the University of Montana embodies and promotes honesty, integrity, accountability, rights, and responsibilities associated with constructive citizenship in our academic community. This Code describes expected standards of behavior for all students, including academic conduct and general conduct, and it outlines students' rights, responsibilities, and the campus processes for adjudicating alleged violations. [Full student conduct code.](http://www.umt.edu/vpsa/policies/student_conduct.php) [http://www.umt.edu/vpsa/policies/student\\_conduct.php](http://www.umt.edu/vpsa/policies/student_conduct.php)

### Course Withdrawal

Students may use Cyberbear to drop courses through the first 15 instructional days of the semester. Beginning the 16<sup>th</sup> instructional day of the semester through the 45<sup>th</sup> instructional day, students use paper forms to drop, add and make changes of section, grading option or credit. PHSX 216 may not be taken as credit/no-credit.

### Disability Modifications

The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and [Disability Services for Students](https://www.umt.edu/dss/default.php). <https://www.umt.edu/dss/default.php> If you think you may have a disability adversely affecting your academic performance, and you have not already registered with Disability Services, please contact Disability Services in Lommasson Center 154 or call 406.243.2243. I will work with you and Disability Services to provide an appropriate modification.

### Grading Policy

Generally, final letter grades fall within these ranges:

A or A- = 90-100%. B+, B, or B- = 80-89%. C+, C or C- = 70-79%. D+, D or D- = 60-69%. F = 59% or less.

Your grade will be based on the following:

Pre-Lab quizzes: 10%

Lab quizzes and reports: 90%

## Lab Schedule

<b>Date</b>	<b>Lab and Assessment</b>
<b>Week 1: Aug 29 – Sept 2</b>	Introduction to Error Analysis and Python Programming CHCB 229 – regular lab room
<b>Week 2: Sept 5 – 9</b>	Quiz: Introduction to Error Analysis and Python Programming NO LAB, Labor Day
<b>Week 3: Sept 12 – 16</b>	Pre-lab Quiz and Experiment: Measuring $g$ CHCB 225
<b>Week 4: Sept 19 – 25</b>	Quiz and Write-up Due: Measuring $g$ Pre-lab Quiz and Experiment: Projectile Motion
<b>Week 5: Sept 26 – 30</b>	Quiz and Write-up Due: Projectile Motion Pre-lab Quiz and Experiment: Force Tables
<b>Week 6: Oct 3 – Oct 7</b>	Quiz and Write-up Due: Force Tables Pre-lab Quiz and Experiment: Hooke's Law
<b>Week 7: Oct 10 – 14</b>	Quiz and Write-up(full) Due: Hooke's Law Pre-lab Quiz and Experiment: Circular Motion
<b>Week 8: Oct 17 – 21</b>	Quiz and Write-up Due: Circular Motion Pre-lab Quiz and Experiment: Ballistic Pendulum
<b>Week 9: Oct 24 – 28</b>	Quiz and Write-up Due: Ballistic Pendulum Pre-lab Quiz and Experiment: Collisions
<b>Week 10: Oct 31 – Nov 4</b>	Quiz and Write-up Due: Collisions Pre-lab Quiz and Experiment: Moment of Inertia
<b>Week 11: Nov 7 – 11</b>	NO LAB, Election Day and Veterans Day
<b>Week 12: Nov 14 – 18</b>	Quiz and Write-up(full) Due: Moment of Inertia Pre-lab Quiz and Experiment: Raspberry Pi Lab
<b>Week 13: Nov 21 – 25</b>	Quiz and Write-up Due: Raspberry Pi NO LAB, Thanksgiving
<b>Week 14: Nov 28 – Dec 2</b>	Pre-lab Quiz and Experiment: Archimedes' Principle
<b>Week 15: Dec 5 – 9</b>	Quiz and Write-up Due: Archimedes' Principle Pre-lab Quiz and Experiment: Mystery Lab
<b>Week 16: Dec 12 – 20</b>	Write-up Due: Mystery Lab NO LAB, Finals week