Spring 2018: Fundamentals of Physics
— SYLLABUS —

PHY 2002L: BTRA, L, X — TR 9:05 a.m. – 10:20 a.m.
Lecture Room: 1203, 17 Lexington

Contact Info	Professor Daniel Richford, drichford@gradcenter.cuny.edu Rm. 938, 17 Lexington; Mailbox in Rm. 506, 17 Lexington Office Hours: Tuesdays, 8 a.m. – 9 a.m.; and by appointment
Textbook	Recommended: Rex & Wolfson, *Essential College Physics*, vol. 1 ISBN: 978–0–321–61116–1
Grading	Homework: 30% Exams: 60% (three exams: best exam score 30%, second best 20%, lowest 10%) Class attendance and participation: 10%
Problems & Homework	You can access the graded homework on Pearson's *Mastering Physics* platform: *www.pearsonmylabandmastering.com/northamerica/masteringphysics/* Additional practice problems mimicking likely test questions are available at: *www.github.com/drichf1/Homework_for_Undergrad_Lectures*
Learning Objectives	Understanding basic physics and gaining insight into fundamental physical principles and mathematics; development of quantitative skills, analytical reasoning, and critical thinking through problem solving; appreciation of the power and beauty of modern science and its central role in civilization & culture.
Attendance	Up to 2 (two) unexcused absences allowed; each additional unexcused absence deducts 5% from the class participation and attendance grade. Unexcused absence from 5 (five) or more lecture sessions draws a WU grade for the course.
Academic Honesty	Baruch's Policy on Academic Honesty states, in part— *Academic dishonesty is unacceptable and will not be tolerated. Cheating, forgery, plagiarism and collusion in dishonest acts undermine the college's educational mission and the students' personal and intellectual growth. Baruch students are expected to bear individual responsibility for their work, to learn the rules and definitions that underlie the practice of academic integrity, and to uphold its ideals. Ignorance of the rules is not an acceptable excuse for disobeying them. Any student who attempts to compromise or devalue the academic process will be sanctioned.* Academic dishonesty in this will not be tolerated and automatically results in an F for the course. A report of suspected academic dishonesty will be sent to the Office of the Dean of Students. Additional information and definitions can be found at www.baruch.cuny.edu/academic/academic_honesty.html.
Disability Accommodation	Students with disabilities may be eligible for a reasonable accommodation to enable them to participate fully in courses at Baruch. If you feel you may be in need of an accommodation, please contact the Office of Services for Students with Disabilities at (646) 312–4590.

Lecture Schedule		
Course topics, session topics, dates, assignments, and pacing all subject to change	Tuesday, January 30	Course overview; Introduction
	Thursday, February 1	Introduction (cont.)
	Tuesday, February 6	Math Review; Position
	Thursday, February 8	Position; Distance vs. Displacement
	Tuesday, February 13	Velocity & Speed
	Thursday, February 15	Acceleration, Mass, Newton's Laws
	Thursday, February 22	
	Tuesday, February 27	
	Thursday, March 1	Circular Motion
	Tuesday, March 6	Review 1
	Thursday, March 8	Exam 1 (*subject to change*)
	Tuesday, March 13	Rotation & Angular Momentum
	Thursday, March 15	Moments of Inertia & Torque
	Tuesday, March 20	
	Thursday, March 22	Energy & Work & Gravitation
	Tuesday, March 27	
	Thursday, March 29	
	Tuesday, April 10	Special Relativity Intro
	Thursday, April 12	
	Tuesday, April 17	
	Thursday, April 19	
	Tuesday, April 24	Review 2
	Thursday, April 26	Exam 2 (*subject to change*)
	Tuesday, May 1	Fluids & Drag
	Thursday, November 28	
	Tuesday, May 8	Heat & Thermodynamics
	Thursday, May 10	
	Tuesday, May 15	Final exam review
	Final Exam Day	To be determined

Fall 2018: Lab
PHY 2001: BTRA — TR 10:45 p.m. – 12:00 p.m. – Room 1000E

Contact Info	Professor Richford, drichford@gradcenter.cuny.edu Rm. 939, 17 Lexington; Mailbox in Rm. 506, 17 Lexington Office Hours: Tuesdays, 8 a.m. – 9 a.m., and by appointment

Lab Details

The lab schedule has yet to be determined; however, there will be at least 4 recitation sessions quiz will be given at the beginning of each recitation, after which, problems from lecture and homework will be solved on the board.

All lab reports must be submitted no later than one week after the experiment is completed; these will be graded on a scale of 0–18. No credit will be given for a report submitted without completion of the experiment. Late lab reports will be penalized 4 (two) points (out of 18 [eighteen]) for each academic day of lateness. No reports will be accepted one week after the due date.

Although the experiment may be done in groups, each student must submit an individual lab report.

Lateness to lab sessions is penalized 1 (one) point (out of 18 [eighteen]) for each five-minute block of lateness off that session's corresponding lab report or quiz grade (for example, five minutes' lateness—one point deducted, six minutes' lateness—two points deducted). If you are more than 30 (thirty) minutes late, you will be considered absent from that session.

Lab Report Structure

A lab report must consist of the following, in the following order:
1. Name, names of lab partners, title, introduction
2. Procedure of experiment, including diagram and description of any apparatus, and journal of the experiment
3. Theory of underlying physics being tested
4. Experimental data
5. Calculations and error analysis
6. Conclusions and sources of error
7. Solutions to problems posed in the lab manual

Lab Report Formatting

Margins: 1-inch top and bottom, 1.5-inch left and right (drawings and tables may exceed margins)
Font: any roman font, 12-point size, 15-point spacing
Paragraph: fully justified text, right-ragged data; no space between paragraphs in the same section; do not indent first line of first paragraph in each section; indent first line of succeeding paragraphs by half an inch
Header/Footer: name, current page, and total number of pages on each page

Laboratory Schedule		
Experiments, session topics, dates, and quizzes subject to change	Tuesday, January 30 Thursday, February 1	Experiment 1: Measurements
		Experiment 2: Free Fall
		Experiment 3: Vectors
		Experiment 4: Newton's Second Law
		Recitation 1
		Experiment 5: Momentum
		Experiment 6: Torque
	Dates to be determined (order fixed)	Recitation 2
		Experiment 7: Pendulum
		Experiment 8: Springs
		Recitation 3
		Experiment 9: Heat
		Experiment 10: Sound
		Recitation 4

Lab Report Grading Rubric — Guidelines, only (not hard-and-fast rules, because of the likely variations of reports from the brief, example descriptions below)

Formatting		Total: 1 point
	0	*Report is unreadable; report is sloppy or inconsistent with the formatting requirements, or both.*
	1	*Report is neat and consistent with the formatting requirements*

Name/Title/Introduction Section		Total: 1 point
	0	*Missing any one of the following: name, names of lab partners, title, introduction*
	1	*Contains all of the above*

Procedure and Journal Section		Total: 2 points
	0	*Section missing*
	1	*Brief description present and adequate; diagram unclear; journal absent*
	2	*Brief description and diagram present and clear; journal address challenges faced*

Theory Section		Total: 1 point
	0	*Section missing or inadequately demonstrates student's understanding of the experiment*
	1	*A brief description of the underlying theory being tested reflects student's understanding*

Data Section		Total: 1 point
	0	*Section missing; data are present yet organized haphazardly or in sentences, or are incomplete, unclear, etc.*
	1	*Data are present, organized logically, clearly*

Calculations and Error–Analysis Section		Total: 1 point
	0	*Section missing; formulas used are absent, conclusions are absent, or intervening steps are absent; error not addressed; sentences used instead of algebraic equations*
	1	*Formulas, conclusions, and steps are present, error adequately accounted for*

Conclusions and Sources of Error Section		Total: 2 points
	0	*Section missing; conclusions unclear, not fitting the data and calculations; sources of error absent or unclear, or not fitting with the experiment*
	1	*Conclusions address the fit between theory and experiment inadequately; sources of error vague or incomplete*
	2	*Conclusions adequately address the fit between theory and experiment; sources of error specific and appropriate*

Posed-Questions Section		Total: 1 point
	0	*(If required by lab manual) Section missing; not all questions answered or answers inadequate*
	1	*(If required by lab manual) Section present; all questions answered adequately*
	1	*(If not required by lab manual) Section missing*

Sample Lab Report: Measurement Lab
(Please note that this report is inconsistent with the formatting requirements on this Syllabus. Please note that this lab does not require error analysis or theory, and has no posed questions.)
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    Class: Physics 2002 Lab, Prof. B. Wecht
     Name: Leigh Daniel Avidan
Partners: Arin Hansen
          Suzy Berhow
     Date: Thursday, January 18, 2018
      Lab: 1. Measurement

Introduction:
    In this lab, we measure the mass of a penny, the diameter of a C.D., and the length, width, and height of a book; we used a triple-beam balance, a Vernier caliper, and a meter-stick. The goals of this lab are to practice measuring with some of the tools we'll be using in almost every lab, to practice calculating quantities from experimental data, and to gain more experience thinking about errors and uncertainty in measurement.

Procedure and Journal:
    We measured the mass of a penny using the triple beam balance; we had trouble zeroing the scale, but managed to zero it out after Professor Wecht showed the class how to. We measured the diameter of a C.D. using the vernier caliper. We were initially unable to read the vernier scale on the caliper, but Professor Wecht came over and showed us how—-after which we measured the diameter of the C.D. to greater precision. We measured the height, length and width of our textbook with the meter stick. (Diagram not necessary)

Theory Section:
   (Not applicable—-we just used algebra and unit conversions)

Data Section:

```
-----------------------
| Quantity  | Value   |
-----------------------
| mass of   |   5.4g  |
| penny     |         |
|           |         |
| diameter  | 12.01cm |
| of C.D.   |         |
|           |         |
| length of |  5.0cm  |
| book      |         |
|           |         |
| width of  |  1.0cm  |
| book      |         |
|           |         |
| heighth   |  2.0cm  |
| of book   |         |
-----------------------
```

Calculation and Error-Analysis Calculation Section:

1. Convert mass of penny to kilograms:

$$5.4g \times \frac{1\ kg}{1000\ g} = 0.0054\ Kg$$

2. Calculate volume of book in cubic centimeters:

V = L x W x H
  = (5.0 cm) x (1.0 cm) x (2.0 cm)
  = 10.000 cm^3
 -> 10. cm^3 <- (proper significant figures)

3. Convert volume of book to cubic meters:

$$10.0\ cm^3 \times \frac{1\ m}{100cm} \times \frac{1\ m}{100cm} \times \frac{1\ m}{100cm} = 0.00001\ m^3$$

4. Calculate diameter of C.D. in centimeters:

$$d = 2 \times r \ \rightarrow \ r = \frac{d}{2}$$
$$= \frac{12.01cm}{2}$$
$$= 6.005\ cm$$
  -> 6.005 cm (proper significant figures)

5. Calculate area of C.D. in squared centimeters:

A = pi x r^2
  = (3.1416) x (6.005 cm)^2
  = 113.28617454... cm^2
 -> 113.3 cm ^2 <- (proper significant figures)

6. Convert area of C.D. to squared meters:

$$113.3\ cm^2 \times \frac{1\ m}{100\ cm} \times \frac{1\ m}{100\ cm} = 0.01133\ m^2$$

Conclusions and Sources of Error Section:
    We successfully measured and calculated the quantities required by the lab manual. Sources of error we faced during this lab, or which were relevent to our experience of measuring, were:
    (1) uncertainty beyond millimeters on the meter stick:
        had we used the vernier caliper to measure so small a book as we had, we would have had more accurate measurements
    (2) uncertainty beyond tenths of a millimeter on the
        vernier caliper and beyond tenths of a gram on the triple-beam balance: obviously, we were limited by the equipment provided
    (3) the metric ruler was made of wood, and the day we measured was particularly hot and humid, which
        likely caused the wood to expand a little
    (4) calculation error: although we were explained significant figures by Prof. Wecht, we still had
        some trouble deciding where to round our calculations; the resources on the Internet and in our textbook were contradictory, so we followed Prof. Wecht's rules as best we could
    (5) errors in the act of measurement: Arin noticed that the angle from which we measured the book with the meter stick caused up-to-2 millimeter errors, and it was difficult to be sure that our
        vantage point was exactly perpendicular to the stick while we measured
  and (6) although we were proud of our accurate measurement of the C.D., we had trouble centering
        the caliper over the diameter, so we may have actually been measuring a close-to-the-diameter chord of the circle.

Posed Question Section:
    Not applicable
==
Grading:
                    Formatting: 0
              Name/Title/Intro: 1
            Procedure & Journal: 2
                        Theory: --
                          Data: 1
    Calculations and Error-Analysis: 1
Conclusions and Sources of Error: 2
              Posed-Questions: 1
                           ---
                    8 out of 9