Boston University
PY106 Summer II 2021
Elementary Physics II

Professor: Paul Trunfio
Office: SCI 200A (but virtual office on Zoom for the time being)
Email: **trunfio@bu.edu** – put **PY106** somewhere in every subject heading (but Piazza is preferred)
Phone: 617-353-9041
Office Hours: to be arranged

Teaching Fellows: TBD
Learning Assistants: TBD

A1 (Lecture + Studio Collaboration) – M/T/W/R/F 9:00 am – 10:30 am (EST) ** See Class times note
A2 (Lab) – M/W 11:00 am – 2:30 pm (EST) ** See schedule below
A3 (Lab) – M/W 2:30 pm – 6:00 pm (EST)
A4 (Lab) – M/W 6:00 pm – 9:30 pm (EST)

Course Zoom (log into bostonu.zoom.us first with your BU account): **https://bostonu.zoom.us/buphysics/**
We will use one Zoom link for everything (class, labs, and office hours)

Class times: It is expected that all students attend classes when they are held (i.e., synchronously). This is important since the course will be run in a collaborative "studio-like" manner with a 30 minute "lecture" followed by 60 minutes working with your fellow students in teams of 5 on an interactive worksheet, supported by your instructors, with an accompanying graded assessment near the end asking questions from the worksheet graded partly on correctness and partly on participation. This is the ideal way to be engaged in the course. We realize, however, that some situations require flexibility, so we will handle them on a case by case basis.

Description: The CAS PY 105/106 sequence satisfies premedical requirements. PY106 covers the basic principles underlying the physics of everyday life, including electricity and magnetism, direct-current circuits, waves, optics, and modern physics. Students must register for two sections: lecture and a laboratory. Carries natural science divisional credit (with lab) in CAS. This course fulfills a single unit in each of the following BU Hub areas: Scientific Inquiry II, Quantitative Reasoning II, Critical Thinking. Pre-requisite: PY105 (or equivalent).

Course Resources:

1. Course postings, announcements, discussion board: **piazza.com**
2. Homework, quizzes, e-Book: **tophat.com**
3. Labs: **pivotinteractives.com**
4. Grades: **learn.bu.edu**
5. Attendance of classes, labs, and office hours: **bostonu.zoom.us**

For Blackboard, Zoom and Google, you will need to log in using your BU account. For technical information please refer to the following links: Google: www.bu.edu/tech/support/google/; Zoom: www.bu.edu/tech/services/cccs/conf/online/zoom/; Blackboard: www.bu.edu/tech/services/teaching/lms/blackboard/

Textbook: *Essential Physics*, by A. Duffy, Volume II which is an interactive e-Book integrated with Top Hat course. If you would like another option, we will post a free PDF version and if you prefer a hardcopy, you can buy one from Amazon.

Optional Textbook:
OpenStax College Physics. Free online at: **openstax.org/details/books/college-physics**

Office Hours: All office hours will be posted on Piazza and to our course Google calendar.

Getting online support through Piazza: Please ask all questions for the course through the PY106 site on Piazza. You can also feel free to answer any questions posted by other students – but you should be careful to be helpful without simply giving away answers to homework questions. With all PY106 students, Teaching Fellows, Learning Assistants and your professor monitoring the Piazza site, this should be the best way to get questions answered quickly. If you need to send a private note to all the instructors or just your professor, click on *New Post* > *Question* and *Post to: Individual Students(s) / Instructors(s)*. Type **Instructors** to reach all instructors (including TF's and LA's). You can also send a message to just Paul Trunfio if there's an issue of a more personal nature.

Homework: See Homework section below for more details and calendar.

Labs: See Lab section below for more details and calendar.

Formal Assessments:

1. **Quizzes**: There will be five mini-tests, spaced at the end of each unit of instruction (all at the beginning of class on Mondays, so you can prepare the prior weekend, with the exception of the last one on the last day of class). The content covered in each quiz is indicated in the class schedule (below).
2. **In-class Worksheets**: Each class will consist of interactive lecture (with simulations, animations and video-based demos) followed by the remaining class time working in small groups on worksheets (or "breakout packets"). The worksheets themselves are not graded, but there will be an assessment of your effort on the worksheet for each class via Top Hat.

Grading:

In-class worksheets and participation: 15%
Homework Assignments: 15%
Labs: 15%
Top Hat e-Book Assignments: 5%
Quizzes: 50% - five quizzes each worth 10% of the grade

Grading Scale: We will use an absolute grading scale, so you are not competing with your classmates. This is designed to encourage you to help each other learn.
90.00 – 100 for A– and A
75.00 – 89.99 for B–, B, and B+
55.00 – 74.99 for C–, C, and C+
45.00 – 54.99 for D
< 45.00 for F

All grades are on Top Hat and Pivot and will eventually be in Blackboard Learn. Your login name is your regular BU login name and your password is your BU Kerberos password. It is your responsibility to check that your grades have been recorded correctly. If any of your grades are missing or incorrect, contact your teaching assistant and your professor.

Class Schedule

Every assignment due date, class, lab, office hours, etc. will be accessible to you via a shared electronic calendar

Week 1
Class 01 – 7/6 Tue: Electric Charge (WS-1)
Class 02 – 7/7 Wed: Electric Force (WS-2) | **Lab 1**
Class 03 – 7/8 Thu: Electric Field (WS-3)
Class 04 – 7/9 Fri: Electric Potential Energy & Potential (WS-4) | **Lab 2*** ***Note this is a Monday schedule**

Week 2
Class 05 – 7/12 Mon: Capacitance (WS-5) | **Group Quiz 1 (WS 1-4, HW1, e-Book 1)**
Class 06 – 7/13 Tue: Electric Circuits (WS-6)
Class 07 – 7/14 Wed: Resistor Combinations (WS-7) | **Lab 3**
Class 08 – 7/15 Thu: Kirchhoff's Rules (WS-8)
Class 09 – 7/16 Fri: Magnetic Fields (WS-9)

Week 3
Class 10 – 7/19 Mon: Magnetic Force (WS-10) | **Quiz 2 (WS 5-8, HW2, e-Book 2)**
Class 11 – 7/20 Tue: Magnetic Torque (WS-11)
Class 12 – 7/21 Wed: Magnetic Flux (WS-12) | **Lab 4**
Class 13 – 7/22 Thu: Induction (WS-13)
Class 14 – 7/23 Fri: Medical Applications (WS-14)

Week 4
Class 15 – 7/26 Mon: Waves & Sound (WS-15) | **Lab 5 & Quiz 3 (Classes 9-13, HW 3 & e-Book 3)**
Class 16 – 7/27 Tue: Doppler Effect & Superposition (WS-16)
Class 17 – 7/28 Wed: Standing Waves (WS-17) | **Lab 6**
Class 18 – 7/29 Thu: EM Waves & Polarized Light (WS-18)
Class 19 – 7/30 Fri: Reflection & Mirrors (WS-19)

Week 5
Class 20 – 8/2 Mon: Refraction (WS-20) | **Quiz 4 (Classes 14-18, HW 4 & e-Book 4)**
Class 21 – 8/3 Tue: Lenses (WS-21)
Class 22 – 8/4 Wed: Two-Dimensional Interference (WS-22) | **Lab 7**
Class 23 – 8/5 Thu: Diffraction (WS-23)
Class 24 – 8/6 Fri: Thin Film Interference (WS-24)

Week 6
Class 25 – 8/9 Mon: Blackbody Radiation & Photoelectric Effect (WS-25) | **Lab 8**
Class 26 – 8/10 Tue: Nuclear Physics (WS-26)
Class 27 – 8/11 Wed: Radioactivity (WS-27) | **Lab 9**
Class 28 – 8/12 Thu: Special Topics (WS-28)
Class 29 – 8/13 Fri: **In-Class Group Quiz 5 (Classes 19-26, HW 5 & 6) & e-Book 5**

Homework Schedule: Each homework assignment will include relevant simulations and conceptual questions, which you will spend time during each lab session working through. The graded portion of the homework will be problems on Top Hat. Solutions will be posted immediately after the due date so you can review/compare to your own work. **There will be no extensions granted.**

Assignment 1: Assigned Tuesday, July 6; Due Sunday, July 11: Classes 1-4
Assignment 2: Assigned Thursday, July 8; Due Saturday, July 17: Classes 5-8
Assignment 3: Assigned Thursday, July 15; Due Saturday, July 24: Classes 9-13
Assignment 4: Assigned Thursday, July 22; Due Saturday, July 31: Classes 14-18
Assignment 5: Assigned Thursday, July 29; Due Saturday, August 7: Classes 19-23
Assignment 6: Assigned Thursday, August 5; Due Thursday, August 12: Classes 24-26

Lab/Workshop Schedule: The first hour of each lab will generally be a workshop format where you will collaboratively explore simulations and conceptual questions. Following that, you will work collaboratively on the lab activity, submitting a lab report (online via Pivot) by the end of the lab period, consisting of data collection, analysis and some questions.

Lab 1: Wednesday, July 7: Electric Charge
Lab 2: Friday, July 9: Electric Potential * Friday 7/9 is a Monday schedule
Lab Period: Monday, July 12: No Pivot Lab | **Quiz 1 (WS 1-4, HW1, e-Book 1)**
Lab 3: Wednesday, July 14: Electric Circuits
Lab Period: Monday, July 19: No Pivot Lab | **Quiz 2 (WS 5-8, HW2**
Lab 4: Wednesday, July 21: Magnetic Force & Electromagnetic Induction
Lab 5: Monday, July 26: Sound | **Quiz 3 (Classes 9-13, HW 3 & e-Book 3)**
Lab 6: Wednesday, July 28: Standing Waves
Lab Period: Monday, August 2: No Pivot Lab | **Quiz 4 (Classes 14-18, HW 4 & e-Book 4)**
Lab 7: Wednesday, August 4: Lenses
Lab 8: Monday, August 9: Interference & Diffraction
Lab 9: Wednesday, August 11: Photoelectric Effect

Top Hat E-book Modules: The e-book on Top Hat counts for 5% of the course grade, but it is graded out of 50% of the possible total and you get half-credit just for trying each question. Even if you are incorrect in an answer, you will earn points. This means that you should not stress about getting every correct answer. After two incorrect answers, Top Hat will show you the correct answer as well as an explanation. The goal of the Top Hat e-book assignments is to give you some incentive to read and practice outside of class.

The Top Hat e-book modules are split into five parts, which match the topics that are the focus of the quizzes. **The best way to use the e-book is to keep up with the class material, rather than waiting until just before the due dates to do it.** The module due dates align with the quizzes. For example, the first section of e-book modules is due midnight on the evening after Quiz 1, and that pattern continues for all the other e-book sections.

Makeup Policy: It is your responsibility to do all workbook exercises, homework and labs according to the posted schedules. Because of the fast-paced nature of the course, there are no makeups. ***In exceptional circumstances, please contact Prof. Trunfio as soon as possible.***

Ethics Policy: As a student at Boston University, you are expected to be familiar with and adhere to the College of Arts and Sciences Academic Conduct Code. In particular, cheating on exams and quizzes or unauthorized collaboration on lab work will not be tolerated. Evidence of cheating will be reported immediately to your Academic Conduct Committee. Students found guilty of cheating on exams may be penalized by suspension or even expulsion. Link to the code: https://www.bu.edu/academics/policies/academic-conduct-code/

Getting Started with Top Hat

We will use Top Hat for four different aspects of our course this semester, all of which count toward your grade:

- In-class quizzes coupled to group worksheet activities (graded partly on participation and partly on correctness)
- On-line homework
- An interactive e-book
- Quizzes

Even if you have an existing Top Hat subscription, there will be an extra fee for Top Hat for our course because of everything we are doing with it. At the start of the semester, you will get an e-mail invitation to join your PY106 section on Top Hat. Here are the pricing options.

Warning - prices on Top Hat are often higher than shown below, but if you click through to the final payment page it should show a discount to one of the prices below.

Top Hat pricing options	Price (with tax extra)
No existing Top Hat subscription, one semester access	$46
No existing Top Hat subscription, full summer access	$80
Existing Top Hat subscription, one semester access	$20
Existing Top Hat subscription, PY105+PY106 access	$40

Getting the most out of Top Hat

Homework: You have **five** chances to submit each answer on each online homework assignment. Use your submissions wisely. Note that you can submit the answers to each question individually - you do not need to fill in answers for the whole assignment first. Each time you submit, Top Hat tells you whether you are right or wrong, and then (on the homework) you get more chances to correct anything you got wrong.

Things to keep in mind when using Top Hat:

- Start early.
- Come to office hours for help.
- Feel free to work together with other students, but try to do as much as you can on your own.
- Do not hit the refresh button on your browser - that can count as a submission.

In general, Top Hat expects numerical answers to be within 1% of the correct answer, so do not round off until the very end and use at least three significant figures in your answers.

Getting Started with Pivot Interactives

We will use Pivot Interactives for labs. At the start of the semester, you will get an e-mail from your professor with a class key for your specific section.

Follow these steps:

1. Go to https://www.pivotinteractives.com/
2. Click on Join a Class (on the top menu bar)
3. Enter the class key you received in the email from your professor. This class key is case-sensitive!
4. You will see your section pop up: PY106 Summer 2021, etc. then click "Confirm"
5. This will take you to a Sign Up page to create an account. For your e-mail address, you need to use your BU email.
6. ***The cost for the semester is included in your course lab fee.***

Getting the most out of Pivot Interactives

All labs will be through Pivot Interactives, where you'll be recording data and responding to questions. The focus will be on analyzing and interpreting your data.

Here are some things to keep in mind:

1. Data analysis: While it is important that results be neatly tabulated and calculations performed correctly, it is equally important that you understand the point of each measurement and the connection between the data obtained and the theory under examination.
2. Think critically, and question everything. Pay attention to the subtle details. If, for instance, your numbers are consistently lower than what you expect, can you come up with a good explanation?
3. Conclusions should follow from the data! We are less concerned with the results than the quality of your argument.
4. Don't blame results you get on "human error." If you make a mistake in the lab then you can correct it and repeat the measurement. Work carefully, trying to minimize sources of error, and really think about whether the theory applies 100% to the real world where you're taking measurements.