

Physics 18a/b Course Syllabus

Contact Information:

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Course Objectives:

All assignments, experiments, and assessments are designed with at least one if not more of the following objectives in mind:

- To teach you several basic physics concepts and how to apply them in an experimental setting;
- To familiarize you with several common techniques, pieces of equipment, and analysis tools used in modern biophysics laboratories;
- To teach you how to design your own experiment, test your own hypothesis, and critically and objectively interpret your results;
- To introduce you to practical skills such as estimation, dimensional analysis, and scaling;
- To familiarize you with working collaboratively with colleagues and peers;
- To help enhance your scientific communication skills.

Learning Objectives:

By the end of this course you should be able to:

- Perform basic biophysical laboratory techniques such as brightfield microscopy, digital video microscopy, image analysis, and scientific computing.
- Create a simple laboratory protocol using web and peer reviewed resources.
- Quantitatively analyze, interpret, and troubleshoot data from scientific experiments.
- Formulate reasonable conclusions when presented scientific data and design rational hypotheses.

The following is required of every student enrolled in Physics 18a/b:

- You must attend the lab section for which you are registered. In the case of a legitimate scheduling conflict, email the course professor with documentation from academic services at least 24 hours in advance of the lab. You may be allowed to attend a different section if necessary.
- Before coming to lab, you should read the lab and complete the pre-lab assignment. Late or inappropriately constructed pre-labs will not be accepted.
- You must attend the weekly lab lecture. During these lectures we will review topics, introduce new concepts, go over important announcements, and discuss the week's laboratory information. You are responsible for knowing and understanding this information and it will be included on exams.
- You may not leave lab for any unauthorized reason during your scheduled lab section and you must stay until the day's experiment is completed.
- You must participate and engage with your lab members.
- You must collect enough data of sufficient quality to answer all Results and Discussion questions. Confirm with your TA before leaving if you're unsure.
- You must be appropriately dressed for lab.
- You must record all of your data while in lab. All calculations and metadata (such as the magnification of the objective, frame rate of the digital camera, etc.) must be recorded. Electronic data files should be downloaded to a personal flash drive or upload to a file share (e.g. Dropbox, etc.) before leaving.
- You are expected to check the Physics 18a/b Latte site regularly. This course is constantly evolving. Important announcements and syllabus updates will be posted on a semi-regular basis and you are responsible for this information.
- Email is a reliable way to contact staff members. Please expect a 48 business-hour turn-around time on all email inquiries (longer over weekends) and plan accordingly.

Grading and Evaluation

Grades will be determined base upon the following:

Assignments (70%)

Learning how to analyze, interpret, and communicate experimental findings are key components of this course. As a result, the bulk of your grade will come from assignments, in which you will present and interpret data, formulate hypotheses, discuss sources of uncertainty and the limitations of your experiments, draw conclusions, etc. The quality and thoroughness of your experimental approach and results will also factor into your grade. Each assignment is due at the beginning of your section to your TA one week following the completion of lab.

Correcting and resubmitting assignments. You may correct and resubmit each assignment once if you choose. For each corrected answer, you must write a few sentences describing the shortcomings and inaccuracies of your original answer, and how you have addressed those issues in your corrected answer. Your final grade on each assignment will be computed by averaging together the original and resubmitted scores.

Note: Late submissions of your reports or resubmissions will not be accepted for any reason. If you fail to turn in your assignment, a zero will be averaged into your grade for this report.

Exam (10%)

There will be one final exam in lab lecture. The exam is worth 10% of your grade. Because exams are scheduled during regular class time, there is a no make-up policy for any exam.

Laboratory Exam:

Material covered: Lab and lectures: 1-9

Final exams will not be returned, but you may look over your exam in the professor's office.

Exam re-grades must be submitted in writing within 48 hours of exams being graded. These must be submitted in writing directly to the course professor. All re-grade requests must be accompanied by a student signature. In all cases, your entire exam will be re-graded.

Presentation (10%)

During 'Lab 9' you will be asked to deliver a scientific presentation to your classmates about a lab you completed this semester. The presentation will be based on a PowerPoint presentation created to accompany your talk. The quality of your visual presentation, conceptual knowledge, and scientific delivery will be assessed. Note that a presentation often contains a brief background statement, a rationale or purpose for an experiment, a description of the technique used, a brief statement of the results and the accompanying conclusions, and implications or impact of the results.

Participation and Professionalism (10%)

Participation and professionalism points will be determined from the following:

- A written 'Purpose' and completed pre-lab questions must be turned in at the beginning of lab every week. Your answers should reflect your best attempts at correctly and completely answering the questions provided. If all questions are attempted, you will receive full credit. (10%)
- Conduct and participation in lab (negative points assessed against the weekly 10%).
 - Investing effort into your experiment
 - Collecting a sufficient amount and quality of data needed for the assignments
 - Paying attention to course staff
 - Participating in class-wide discussions and question sessions
 - Respecting the lab environment
 - Maintaining a respectful, professional tone in conversations, office hours, in the laboratory, and via email
 - Cleaning up after yourself
 - Working/dressing/behaving in a safe and professional manner
 - Punctuality

Academic Integrity

Academic integrity is central to the mission of educational excellence at Brandeis University. Each student is expected to turn in work completed independently, except when assignments specifically authorize collaborative effort. It is acceptable to use the words or ideas of another person provided the source is properly acknowledged. You must use proper citations and quotation marks to indicate the source of any phrases, sentences, paragraphs or ideas found in published volumes, on the internet, or created by another student. Note that the use of full quotations is not acceptable. Violations of University policy on academic integrity, described in Section 4 of Rights and Responsibilities, may result in failure in the course or on the assignment, and could end in suspension from the University. If you are in doubt about the instructions for any assignment in this course, you must ask for clarification. Further, please notice that this course and the assignments contained within it are different from previous years. The use of written assignments from previous years as reference material is strongly discouraged as expectations and rubrics change from year to year.

Any course materials including assignments, exams, podcasts, procedures, etc. are the sole property of the course professor in connection with Brandeis University and are to be used only by students enrolled in Physics 18a/b. Any unauthorized electronic or print distribution of this material is expressly prohibited.

Disability

If you are a student with a documented disability on record at Brandeis University and wish to have a reasonable accommodation made for you in this class, please see your instructor immediately.

Expectations

Success in this 2 credit hour course is based on the expectation that students will spend a minimum of 6 hours of study time per week in preparation for class (readings, papers, discussion sections, preparation for exams, etc.).

Experiential Learning Statement

This course is designated as an Experiential Learning course. You will perform hands-on scientific experiments every week that will require your participation in inquiry-driven problem solving, like that encountered in academic research. You will need to design your own experimental procedures and think on your feet to solve problems as they crop up. Working together with your classmates, you will develop experimental techniques and interpret your results quantitatively. You will also read and analyze primary literature relevant to your ongoing work. You will learn to communicate your results and your interpretation to a scientific audience through visual aids (e.g. graphs and illustrations), written documents, and verbal presentation. The skills you will acquire in this class, including both experimental design, analysis, and interpretation, as well as scientific communication, will be useful as you pursue careers in research and medicine.