

JOHN JAY COLLEGE OF CRIMINAL JUSTICE
The City University of New York
GENERAL PHYSICS (PHY 203) SYLLABUS

Spring, 2018

***** Overview for both LECTURE and LAB Curricula *****

Instructor: Max Bean

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OFFICE HOURS:

Wednesdays, 12:05-2pm, location TBD
Tuesdays, 8:35pm-9:35pm, NB 3.65

If you plan to attend office hours, PLEASE let me know by email or in class.
If no one wants to meet with me, I may leave the building.

Semester Credit Hours: 4 per Semester.

Prerequisite: Math 241

Brief Course Description:

This is the first semester of a two semester introductory course designed to provide the student with a rigorous command of fundamental principles and problems from classical physics. The topics covered this semester comprise the heart of classical mechanics (kinematics, dynamics and conservation). The central theme is *Galileo's Principle of Relativity*. This theme will be expressed in nine distinct but logically consistent forms: After the first three forms are introduced, each subsequent form will frame the next chapter of the course. The ultimate course purpose is to extend the predictive power of the Relativity Principle to the retrodictive program of modern forensic science.



Textbook:

Halliday, D., Resnick, R. & Walker, J. *Fundamentals of Physics*, 10th Edition, Extended

Accommodations for Students with Disabilities:

Qualified students with disabilities will be provided reasonable academic accommodations if determined eligible by the Office of Accessibility Services (OAS). Prior to granting disability accommodations in this course, the instructor must receive written verification of a student's eligibility from the OAS which is located at L66 in the new building (212-237-8031). It is the student's responsibility to initiate contact with the office and to follow the established procedures for having the accommodation notice sent to the instructor.

Statement of the College Policy on Plagiarism:

Plagiarism is the presentation of someone else's ideas, words, or artistic, scientific, or technical work as one's own creation. Using the ideas or work of another is permissible only when the original author is identified. Paraphrasing and summarizing, as well as direct quotations require citations to the original source. Plagiarism may be intentional or unintentional. Lack of dishonest intent does not necessarily absolve a student of responsibility for plagiarism. It is the student's responsibility to recognize the difference between statements that are common knowledge (which do not require documentation) and restatements of the ideas of others. Paraphrase, summary, and direct quotation are acceptable forms of restatement, as long as the source is cited. Students who are unsure how and when to provide documentation are advised to consult with their instructors. The Library has free guides designed to help students with problems of documentation.

LEARNING OUTCOMES

KNOWLEDGE: upon completion of this course, a successful student will have developed knowledge & understanding of:

- The concepts of velocity, acceleration, force, linear momentum, angular momentum and energy, and the relationships among these concepts;
- The relationship between instantaneous and average functions.
- Newton's Laws of Motion and the three fundamental theorems of conservation.
- The way in which these laws can be used to make **predictions** about what will happen in the future, based on information gathered in the present.
- The way in which, in the context of forensic science, these laws can be used to make **retrodictions** and discoveries regarding what happened in the past, based on information gathered in the present.

REASONING: Upon completion of this course, a successful student will have been challenged and guided regarding how to:

- **Apply** the calculus perspective on intervals of infinitely large and infinitely small dimension **to** physical situations.
- **Derive** the calculus principles **from** analysis of the properties of motion through space and time.
- Relate and apply various forms of Galileo's Principle of Relativity in order to solve problems regarding kinematics, dynamics and conservation in space and time.
- Infer, apply, and abstract the concept that all inertial frames of reference produce distinct but equally correct measurements; reason from and to the premise that velocity is relative.
- Choose a coordinate system in such a way as to produce a solution that is not merely correct but also simple, clear and concise.
- See how the laws and topics of classical physics, as well as the driving assumptions of modern forensic physics and criminalistics, can be deduced from Galileo's Principle of Relativity.

PRACTICAL SKILLS: upon completion of this course, a successful student will be able to

- Design, build, measure, analyze and trouble-shoot mechanical experiments involving inclined planes, pendulums and collisions.
- Use calculus and careful English in order to develop techniques for solving never-before-seen problems. Use Logger Pro and Excel software in order to gather data and relate independent to dependent variables.

COMMUNICATION SKILLS: through this course, a successful student will:

- Learn to approach physics as a language, rather than as a body of information.
- Come to regard equations as complete sentences.
- Develop an ability to communicate clearly about quantitative material, through **Board Meetings**, Socratic lectures, and collaborative assignments.

COURSE WEBPAGE

Web address: www.yaverbaum.org

Consult the website **regularly**—every day—for syllabus, assignments, course information and updates. The web-page is used for the assignment calendar, supporting documents, exam preparation—in short, everything. Blackboard provides a link to the above site.

The website has links for 203 Lab and 203 Lecture in the table at the bottom. Both the lecture and lab page contain some general policy and guidelines links at the top. Below these links, there is a table, which is a class-by-class calendar, where you will find all relevant information to each class period in the course.

The table on the **LECTURE PAGE** has **5 columns**: Date, Lecture, Reading, Assignment, Principle. The **Date Column** just shows the date. The **Lecture Column** shows the topic of the lecture. The **Reading Column** shows the reading to be completed **prior** to that lecture. The **Assignment Column** shows the homework assignment to be completed **prior** to that lecture and **handed in at the lecture**. The **Principle Column** shows principles and equations that will be introduced in lecture.

DATE	LECTURE	READING	ASSIGNMENT	PRINCIPLE
January 29	Introduction: Things in Space and Time	Physics Is About ...	No Problems Due for First Class	<p><i>Galileo's Principle of Relativity</i></p> <p>Form #1: The laws of physics hold in all <i>unaccelerated</i> reference frames*.</p> <p>Form #2: No experiment can measure the speed or direction of a solitary object through space itself.</p> <p>Form #3: Speed and direction are relations, not properties; the motion of one object is not</p>

The table on the **LAB PAGE** has 4 columns: Date, Experiment, Assignment, and Principle. The **Date Column** shows the date. The **Experiment Column** shows the name of the lab for that day and **A LINK TO THE LAB INSTRUCTIONS**. **You are responsible for reading the lab instructions prior to arriving at lab**. The **Assignment Column** contains links to the instructions for each Post-Lab as well as other useful reminders. The **Principle Column** shows key principles and equations that will be used in that lab.

LAB WEEK	EXPERIMENT	ASSIGNMENT	PRINCIPLE
Wed., January 29	<p>IA. Train of Thought</p> <p>(Done During Lecture)</p>	First Lab Period: No assignment due.	<p><i>Galileo's Principle of Relativity</i></p> <p>Form #1: The laws of physics hold in all <i>unaccelerated</i> reference frames.</p> <p>Form #2: No experiment can detect an absolute speed or direction through space.</p> <p>Form #3: All speeds and directions are relations; the motion of one object is not meaningful without comparison to another</p>
Fri., January 31	<p>IB. Magnitude, Measurement & Motion</p> <p>(Done During Lab)</p>		

*** The course Web-Page is dynamic; it responds in real-time to the flow and needs of a particular class. Be prepared for changes in the sequence of assignments. ***Check the web frequently and do not try to work many weeks in advance of assignments.*** ***

The assignments and labs are often links to original documents. You are always expected to ***print out and bring*** whatever is due and relevant for a particular class meeting.

You are then expected to complete all assignments on separate sheets of paper.

IMPORTANT WARNING: Most of the problems in the homework assignments are *NOT* exercises intended to review what was already discussed in lecture. They are the reverse. They are (often challenging) problems to consider and attempt to solve ***prior to lecture.***

Each problem set assumes that you have done the relevant reading and that you are trying your best to push yourself to the next level of problem-solving skill and concept application.

Do NOT expect to be able to solve every problem correctly on homework assignments. DO expect to spend time and energy on assignments. The lectures are designed to help you learn FROM your struggle with the assignments. If you have not struggled with the assignments, you will not get as much out of lecture.

THE LABORATORY COURSE

Learning Outcomes

The laboratory course will:

- 1) Prepare students for future careers as forensic and research scientists, through experiences designing experiments, analyzing experiment design, writing formal laboratory reports, collaborating with a research team.
- 2) Reinforce physics knowledge, concepts, and reasoning through concrete, physical, sensory, and kinesthetic experiences.
- 3) Help students develop a clear understanding of different types of knowledge and how knowledge is constructed, both in science and in intellectual endeavor in general.

Policies & Procedures

- 1) **Every lab activity is done in a group** of three to four people. The groups will change two times in the semester. The lab-group change dates are indicated on the Lab Webpage.
- 2) The instructions for each lab can be found on the Lab Webpage. You must **download these instructions** and **read them thoroughly** prior to lab period.
- 3) TWO DOCUMENTS PER GROUP will be submitted after each lab and each graded on a 10-point scale. These two documents are the **Post-Lab** and the **Formal Report**. Each is explained below. Both documents **MUST** be typed (though diagrams may be hand-drawn—in fact, hand-drawn diagrams are encouraged.) Many labs take two weeks to complete. You will only write a Post-Lab and Formal Report at the completion of a lab.
- 4) **POST-LAB**: the Post-Lab is a short document to be completed **BEFORE** the formal report. It is designed to help you think about the lab in the way that you need to in order to write the formal report. It always contains four sections, which are explained in detail in the first lab assignment.
- 5) **FORMAL REPORT**: the formal report must conform to a strict format that is contained and explained in detail in the first lab assignment. All details of this format, as explained in the first lab assignment, must be met in every lab report, unless explicitly otherwise stated.
- 6) **LAB QUIZ**: on the day that your group hands in the Formal Report for a given lab, each individual in the class will take a quiz. This quiz is not taken as a group. It will have only three short questions and will be taken in the first 5-10

minutes of the period. **PLEASE NOTE: if you are late by even five minutes, you risk missing the quiz and receiving the minimum possible score.** The quiz is graded on a scale from 0.75 (min possible score) to 1.05 (max possible score).

- 7) LAB GRADING: the grade for labs is calculated as follows. The GROUP GRADE is calculated by taking a weighted average of the post-lab and formal lab report (formal lab report is worth twice as much as post-lab). Then, an INDIVIDUAL GRADE is calculated for each student by multiplying the Group Grade by that individual's score on the Lab Quiz. Two examples will make this clearer:

Example 1: say your group gets an 8.0 (i.e. 80) for its Group Grade and you miss your lab quiz, thus receiving an 0.75 on the quiz. Your Individual Grade would be $0.75 \times 8.0 = 6.0$, or **60** .

Example 2: say your group gets a 7.0 (i.e. 70) for its Group Grade and you ace your lab quiz, thus receiving a 1.05 on the quiz. Your Individual Grade would be $1.05 \times 7.0 = 7.35$, or **73.5** .

- 8) Approximately three lab periods during the semester will be devoted to **Board Meetings**, instead of labs. Board Meetings are highly specialized discussions— involving the presentation of student work on white-boards. No written reports are assigned for Board Meetings. The grade is calculated as follows:

- 0 = Absent from discussion.
- 8.5 = Present for discussion, but not actively participating.
- 10 = Present for discussion and contributed at least one substantive and respectful comment.

This grade will have the same weight as a regular lab grade in the final average.

- 9) There will be no lab mid-term; there will be at least one “Lab Practicum”.
- 10) We supply student laptops for laboratory investigations.
- 11) If you know in advance that you have to miss a lab, you may obtain permission of your lab instructor to join another lab period. If the instructor for that lab period gives you permission, you will complete your lab work in a different lab section that week.
- 12) You may miss and make up exactly **one** lab by the method described in (10), above. For any missed labs beyond the one, you will **not** be able to receive a grade for the associated work.
- 13) Instructors have the discretion not to assign a passing grade—for the entire course—to any student who is missing for more than three lab periods.
- 14) **The average of all your lab write-ups (approximately 7) and your board meetings (approximately 3) will count for essentially 25 of your entire Physics 204 grade.** (See below for precise details.)

General Grading:

- 1) There are three exams, two midterms and one final. Each exam counts for 25 of your BASE GRADE. The remaining 25 of your BASE GRADE is your grade from the Lab Course (see above).
- 2) Once this **Base Grade** is calculated, all HOMEWORK CREDIT and any EXTRA CREDIT is then ADDED DIRECTLY to this Base Grade. The calculation for HOMEWORK CREDIT is explained below.
- 3) Every HW assignment is scored out of 4 and all such points are added together. Every zero results in the *deduction* of 1 point from this total. The sum is divided by a constant weighting factor (such as 5) to produce the **Weighted Homework Average**. This weighting factor may differ from semester to semester and is dependent on the overall class dynamic, participation and calendar. This **Weighted Homework Average** is treated as pure percentage points and added to your **Base Grade**, described in step (1).
- 4) All points gained on written "Extra Credit" Assignments as well as up to 1 point for "Class Participation" are **also** added to your **Base Grade**. This class participation evaluation is based on signs of your vocal and auditory engagement in lecture, group work ethic in lab and general assignment trend (e.g. a great many "4"s have an impact that goes beyond the straight numerical sum). The sum of steps (1), (2), (3) and (4) is your **Final Class Average**.
- 5) Please do note: The seeming complexity of the above system is in place so that your homework grade reward CONTINUAL EFFORT AND THOROUGHNESS above all else—even above accuracy of results. All four large assessments will **always**, however, be weighted equally. The grading weights will always, moreover, be precisely **uniform from student to student and from section to lab section**.

The BOTTOM GRADING LINE:

Each exam is given equal weight in a straight average (mean).

Your lab grade is equal to the value of one exam.

The sum total of all earned homework credit and all earned extra credit is added straight onto your class average as raw points.

Homework itself can amount to as much as 12 extra points added to your grade. You cannot "lose" points on homework unless you literally do not submit it.

May the net force be with you.