**John Jay College of Criminal Justice**
The City University of New York
524 West 59th St., New York NY 10019

# PHYSICS 101-01

**Professor: Hiroki Kitayama**
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**Office hours: Tues 2:15-2:45pm and Thurs 2:15-2:45pm, or by appt.**
**Semester and Course Code: Summer 2014, PHY101**
**Lab: TuTh 8:45-11:15am New Bldg 3.65, Section 01**
**Lecture/Recitation: TuTh 11:45am-2:15pm New Bldg 3.65, Section 01**
**Co-requisite: Math 105**

**Textbook:**
Knight, R., Jones, B., & Field, S. (2009). College physics: A strategic approach, 2nd edition, Volume 1 (Chapters 1-16). Addison Wesley. ISBN: 0321598520

→ This book can be ordered online. If you think you might take Phy102, consider purchasing the whole book (not just vol. 1)

→ If you want to save money, students have told me this book is available for free online. We use it solely as a text resource and for hmwk problems, so this is a fine option.

**Course Description:** Phy101 is an algebra-based introductory physics course. Concepts from Phy101 include motion, forces, energy, and momentum. Knowledge will be constructed through experimentation and practices of science. Knowledge will then be applied to understand real-world phenomena, current issues (local and global), and topics of interest. Phy101 requires active learning, engagement, and full participation. *Being physically and mentally present is essential.*

**Learning Outcomes:** As a result of active participation in this course, students will develop the following knowledge, reasoning ability, practical skills, and communication skills.

- **KNOWLEDGE: Develop knowledge of physics concepts including motion, forces, energy, and momentum.** These are the fundamental concepts in mechanics and provide the basis for understanding our physical world and for future study in physics.
- **KNOWLEDGE: Develop a rich understanding of the nature and epistemology of physics.** Students will learn how physics knowledge is constructed and will participate in constructing knowledge as well. This will help students to understand the applications and limitations of physics knowledge and research.
- **KNOWLEDGE: Develop an understanding of the relation of physics and society, in particular, how physics knowledge is socially constructed and how it arises from and applies to current issues and real-world phenomena.** This will allow students to apply physics in their everyday lives and be critical consumers of scientific knowledge.
- **REASONING: Develop metacognition and self-awareness in physics.** Students will build problem-solving and thinking skills, and will reflect on their identities in relation to physics. Physics requires problem solving, creativity, and consciousness. Through practice, students will hone these skills.
- **PRACTICAL SKILLS: Develop skills and abilities related to the practices of physics.** Students will be able to design, perform, and evaluate experimental studies, leading to the development of physics knowledge.
- **COMMUNICATION: Develop collaborative skills.** Students will work in collaboration to study, do presentations, and submit reports. Management skills, accountability,

transparency, and conflict resolution skills will be supported. Students will also learn languages of physics and develop their own representations to communicate ideas.

**Course Policies:**

**1) Attendance:** BEING PHYSICALLY AND MENTALLY PRESENT IS ESSENTIAL. You are required to attend all lecture and lab sessions, and to be on time. The instructor will take attendance at the beginning of class. Two tardies (arrival shortly after class begins) count as one absence. Please see the course instructor after class if you are late. More than four (4) absences are considered excessive and ***you will receive a grade of F***. Work missed due to absence/tardy will not be accepted.

**2) Blackboard:** Course grades will be posted in the online grade book on Blackboard. In addition, resources including PowerPoints and handouts will be posted on Blackboard. Occasionally the instructor will email the whole class via Blackboard – please make sure your John Jay email is working. Contact DoIT for help with John Jay e-mail or Blackboard.

**3) Email:** You will collaborate with your group members via email, and all lab write-ups will be submitted and feedback will be given through email. You are welcome to use your personal email or your John Jay email for communicating and submitting assignments. It is your responsibility to have a working email, check your email often, and respond to communications.

**4) Physics Notebook:** In addition to the course textbook, you will record and organize your knowledge in a 3-ring binder. You will 3-hole punch all notes, documents, and worksheets and organize them by unit in your binder. This will be your self-created text for you to reference.

**5) Required Materials:** 3-ring binder, loose-leaf paper, calculator*, textbook**
*Cell phone calculator may be used during class but NOT during exams.
**Online free version of the textbook is acceptable.

***Suggested Materials:** We will use computers often during class. While we have a class set of 10 computers, feel free to bring your own computer or tablet if you prefer. We are also licensed to install our data analysis software LoggerPro on students' personal computers. Please see the instructor to install the software.

**Grading:** Grade categories are listed below in order of the amount rigor expected on each assignment. The blog and homework are places to play with ideas, practice, and share thoughts, whereas the reflexivity journal, lab work, and exams require deeper reflection, wider scope, and a polished product. In this course self-awareness, research skills, and content knowledge comprise physics mastery.

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| **Blog** | **10%** |
| **Homework** | **15%** |
| **Reflexivity Journal** | **15%** |
| **Lab work** | **20%** |
| **Exams** | **40%** |
| **Total** | **100%** |

*Blog:* We will create a class blog where you can post pictures, videos, thoughts, articles, links, etc. related to your study of physics. Your postings should demonstrate how you see physics in your

world -- there is no right or wrong thing to post about. If you post multimedia, please include a few sentences explaining your thoughts about the posting. You can post as often as you like, but you must post at least 2 times before the midterm and 2 times after the midterm for a 100%.
Your class blog website is jjphysics10101summer2014.blogspot.com/. I will email each of you an invitation to join the blog. Please note that to accept the invitation you must have a gmail account or you will need to create a gmail account. Gmail is a very useful email especially after you graduate college for professional and personal purposes. After you accept the invitation you will become a blog author and you can set-up mobile preferences if you would like to post from a smart phone. However if you do not want to create a gmail account, you can post to the blog by emailing your posting to my mobile preference email: hykitayama.phy10101summer14@blogger.com.
**Remember to sign your name to your postings to received credit.**

*Homework:* Homework is assigned on each day and is due the following class day at the beginning of class. The instructor will check your homework for completion and effort, then each group will present one of the homework problems to the class. Group members will take turns presenting their work. The purpose of this assignment is to practice with ideas while building content knowledge.

*Reflexivity Journal*: Physics is not done in a vacuum. It is done by people in particular times and spaces in society. Physics research does not exist outside of the researcher; it is her/his/their research question, methodology, and interpretation of their perception of the world in which they live. Their work is influenced by their biases, values, and interests, and some scholars argue that scientific research would be made more objective if these subjectivities were made clear.

In this course, you will reflect on your experiences, perspectives, and identities in relation to learning and doing physics. I will provide you with a Reflexivity Journal, and during the last 15 minutes of each day we will all write in our journals. I will provide you with a prompt or you may free write. These 15 minutes are a sacred reflection time and will be done in silence until class ends at 2:15pm. Your grade will depend on the completion of your daily reflections.

*Lab Work:* Labs are conducted in morning class and lab write-ups are due via email the following class day before class **with all authors cc-ed**. Labs are done in groups and each group member must participate equally and will be held accountable. **If a group member does not complete her/his part, the group member is not considered an author and will receive a zero on the lab write-up**. Each group member will take turns being "first author" on a lab write-up, which means s/he is the group manager and is responsible for assuring the lab is completed on time, high quality, and submitted via email with all authors cc-ed. The first author oversees the division of work among group members and coordinates collaboration. Certain tasks must be completed by the end of morning class to receive credit, and it is the responsibility of the first author to have the instructor sign off on their completion. Since there are 12 labs in total, you will be first author on at least 4 labs**.** Other group members will be listed as co-authors. All authors will receive the same grade on each lab. **Students absent on the day a lab is conducted will not receive credit for the lab write-up and will not be listed as an author.** Students will switch groups every four labs, as indicated in the course calendar.

*Midterm and Final Exams:* The midterm and final exams are cumulative and therefore assess course content from the beginning of the course through the exam date. Exams are based on class work, homework, and lab work. At least 1-week notice will be given prior to exam dates. Exams will not be curved and make-up exams will not be given. Sufficient preparation is essential.

*Overall Grade:* The grading scale to the right is the official grading scale for this course. There will be no exceptions to this scale and grades will not be rounded, except as explained here. The "overall" grade in Blackboard will be rounded to the nearest tenth of a point. This is the final grade and no further manipulations will be made. The scale here will then be strictly used. This means that a 72.94% is a "C-" and a 72.95% is a "C." These calculations are done by the computer so there are no judgment calls or "leniency." You should track your overall grade online via Blackboard.

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| **93.0 – 100.0** | **A** |
| **90.0 – 92.9** | **A-** |
| **87.1 – 89.9** | **B+** |
| **83.0 – 87.0** | **B** |
| **80.0 – 82.9** | **B-** |
| **77.1 – 79.9** | **C+** |
| **73.0 – 77.0** | **C** |
| **70.0 – 72.9** | **C-** |
| **67.1 – 69.9** | **D+** |
| **63.0 – 67.0** | **D** |
| **60.0 – 62.9** | **D-** |
| **00.0 – 59.9** | **F** |

*Additional Resources:* The Math and Science Resource Center offers free tutoring if you want extra help with physics or if you want to brush up on your math skills. They are located in the New Building rm 01.94. Phone: 646.557.4635, email: msrc@jjay.cuny.edu, website: www.jjay.cuny.edu/academics/592.php

**College Wide Policies:**

**1) Incomplete Grade Policy:** An Incomplete Grade may be given only to those students who would pass the course if they were to satisfactorily complete course requirements. It is within the discretion of the faculty member as to whether or not to give the grade of Incomplete.

**2) Extra Work During the Semester:** Any extra credit coursework opportunities during the semester for a student to improve his or her grade must be made available to all students at the same time. Furthermore, there is no obligation on the part of any instructor to offer extra credit work in any course. The term "extra credit work" refers to optional work that may be assigned by the instructor to all students in addition to the required work for the course that all students must complete. It is distinguished from substitute assignments or substitute work that may be assigned by the instructor to individual students, such as make-up assignments to accommodate emergencies or to accommodate the special circumstances of individual students.

**3) 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.

| **Physics 101-01 Calendar (Summer 2014)** | | |
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| **Date** | **Topic** | **Lessons and Labs** |
| 5/29 Thurs | Unit 1: Constant Velocity | **#1**<br>**Lab 1:** Constant Velocity -- represent the motion of a buggy moving at constant velocity; create a model for any object moving at a constant velocity.<br>**Concepts:** model, representation, reflexivity<br>**Representations**: drawing, cartoon, analogy, poetry, rhymes, dance, drama, video, etc.<br>***All labs due before the next lab session. So, this lab is due Tues 6/3 before 8:45am.** |
| 5/29 Thurs | | **#2**<br>**Concepts:** position, displacement, velocity (and scalar, vector, frame of reference)<br>**Representations:** position vs. time graphs, velocity vs. time graphs, constant velocity equations, motion diagram & particle model<br>**Hmwk 1**: Chapter 1: Read pgs. 1-24. Do Q (pg. 25) #2, 6, 9, 10 and P (pg. 26) #4, 8<br>***All hmwk due at the beginning of the next lecture session. So, this hmwk is due Tues 6/3 at 11:45.** |
| 6/3 Tues | Unit 2: Acceleration | **#3**<br>**Lab 2:** Constant Acceleration – represent the motion of a marble rolling down a ramp; create a model for any object moving with a constant acceleration. |
| 6/3 Tues | | **#4**<br>**Concepts:** instantaneous velocity, acceleration<br>**Representations:** position vs. time graphs, velocity vs. time graphs, acceleration vs. time graphs, kinematic equations, motion diagram & particle model, pictures<br>**Hmwk 2:** Chapter 2: Read pgs. 30-51. Do Q (pg. 59) #4, 11, 23 and P (pg. 61) #5, 19 |
| 6/5 Thurs | | **#5**<br>**Lab 3:** Motion in the City – analyze the motion of something moving in the city using video analysis; represent its motion in multiple ways. (*This lab requires you to film a video of a moving object outside of the physics classroom. Bring this video to class on 6/5.) |
| 6/5 Thurs | | **#5.5**<br>**Recitation** – Practice key ideas, work on lab and hmwk, review blog.<br>**Hmwk 2.2:** Hmwk 1&2 Review |

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| 6/10 Tues | | **#6**<br>**Lab 4:** Motion Detectors – predict graphical representations of a cart moving up and down a ramp; check predictions with motion detectors; explain why graphs look the way they look.<br>***theory write-up** |
| 6/10 Tues | | **#7**<br>**Apply findings** to solve problems with graphs, mathematics, and other representations; present problem solving<br>**Hmwk 3:** Chapter 2: Read pgs. 30-51. Do Q (pg. 60) #15, 20 and P (pg. 62) #21, 26, 36 |
| 6/12 Thurs | Unit 3: Free Fall | **#8**<br>**Lab 5:** Acceleration due to Gravity ($v_i = 0$) -- represent the motion of a falling object in multiple ways; determine what variables do and do not affect the acceleration of a falling object.<br>***new groups!** |
| 6/12 Thurs | | **#9**<br>**Apply findings** to solve problems with graphs, mathematics, and other representations; present problem solving<br>**Hmwk 4:** Chapter 2: Read pgs. 52-58. Do Q (pg. 59) #2, 7, 22 and P (pg. 63) #40, 43 |
| 6/17 Tues | | **#9.2**<br>**Lab 5.2:** Acceleration due to Gravity ($v_i > 0$) -- represent the motion of a falling object in multiple ways; determine what variables do and do not affect the acceleration of a falling object. |
| 6/17 Tues | | **#9.3**<br>Recitation – Practice key ideas, work on lab and hmwk, review blog. |
| 6/19 Thurs | Unit 4: 2-D Motion | **#10**<br>**Lab 6:** Projectile Motion -- represent the motion of a 2-dimensional projectile by i) dividing the motion into x and y components and ii) applying the constant velocity model and constant acceleration model; create a model for any object moving in a projectile. |
| 6/19 Thurs | | **#11**<br>**Concepts:** independence of x and y directions<br>**Representations:** x and y position vs. time graphs, velocity vs. time graphs, acceleration vs. time graphs<br>**Hmwk 5:** Chapter 3: Read pgs. 82-88. Do Q (pg. 95) #5, 21 and P (pg. 98) #27, 28 |
| 6/24 Tues | Review | **#12**<br>**Review:** Bring together ideas from previous units to solve problems involving motion. |
| 6/24 Tues | Midterm | **#13**<br>*midterm<br>*Bring calculator |

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| 6/26 Thurs | Unit 5: Newton's Laws | **#14**<br>**Lab 7:** Everyday Forces – measure the amount of force required to do everyday tasks; measure the forces acting on an object; represent the forces acting on an object. ***theory write-up** |
| 6/26 Thurs | | **#15**<br>**Concepts:** force, types of forces (gravitational force (weight), normal force, friction, tension, force of a spring, air resistance)<br>**Representations:** force diagrams<br>**Hmwk 6:** Chapter 4: Read pgs. 102-112. Do Q (pg. 125) #2; P (pg. 127) #7, 9, 10, 12 |
| 7/1 Tues | | **#15.2**<br>**Lab 7:** continued<br>***theory write-up** |
| 7/1 Tues | | **#15.3**<br>**Activity:** Reconciling Common Sense with Newton's 1st and 2nd Laws – explain Newton's 1st and 2nd Laws; apply your understanding to explain the case of pulling a child out of a well (explain the forces acting on the child i) just when he begins to move and ii) as he is raised at a constant velocity).<br>**Concepts:** Newton's 2nd Law<br>**Apply findings** to solve problems involving forces |
| 7/3 Thurs | | **#16**<br>**Lab 8:** Newton's First and Second Laws – Determine how forces impact motion: 1) Predict the forces and describe the motion of an airpuck traveling across a i) frictionless and a ii) rough surface. 2) Use a Phet simulation to check your predictions. 3) Analyze the frictionless/friction scenarios using Newton's First and Second Laws.<br>***theory write-up** |
| 7/3 Thurs | | **#17**<br>**Concepts:** net force, equilibrium, mass, inertia, Newton's 1st law, Newton's 2nd Law<br>**Apply findings** to solve problems involving forces.<br>**Hmwk 7:** Chapter 4: Read pgs. 113-119. Do Q (pg. 125) #8, 10, 26; P (pg. 128) #29, 32, 33 |
| 7/8 Tues | | **#18**<br>**Lab 9:** Newton's Third Law -- explain Newton's 3rd Law; apply your understanding to explain real world interactions.<br>***theory write-up**<br>***new groups!** |
| 7/8 Tues | . | **#19**<br>**Concepts:** Newton's 3rd Law<br>**Apply findings** to solve problems involving forces using Newton's Laws.<br>**Hmwk 8:** Chapter 5: Read pgs. 131-158. Do Q (pg. 162) #17, 19, 34, 45, 46, 47 |
| 7/10 Thurs | Unit 6: Energy | **#20** |

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| | | **Lab 10:** Motion, Forces, & Energy – describe and represent the motion of a bouncy ball; the forces acting on the bouncy ball; and the energy of the bouncy ball throughout its motion.<br>***theory write-up** |
| 7/10 Thurs | | **#21,22**<br>**Concepts:** conservation of energy, modes of energy storage (kinetic, gravitational, elastic, internal, and chemical), work, power<br>**Representations:** Energy pie**,** energy bar graph<br>**Apply findings** to explain how energy is conserved in systems through different modes of energy storage, including kinetic, gravitational, elastic, internal, and chemical.<br>**Hmwk 9 due 4/24:** Chapter 10: Read pgs. 289-309. Do Q (pg. 316) #15 and P (pg. 317) #7, 14, 21, 29, 34<br>**Hmwk 10:** Chapter 10: Read pgs. 312-315. Do Q (pg. 316) #23, 24 and P (pg. 318) #42, 43, 58, 68 |
| 7/15 Tues | Unit 7: Circular Motion | **#23**<br>**Lab 11:** Centripetal Force -- determine a relationship between centripetal force and the velocity of an object moving in a circular path; create a model for any object moving in a circle or curve. |
| 7/15 Tues | | **#24**<br>**Concepts:** centripetal force, centripetal acceleration<br>**Representations:** motion diagram & particle model<br>**Apply findings** to solve problems concerning objects moving in circles or around a curve.<br>**Hmwk 11:** Chapter 6: Read pgs. 172-184. Do Q (pg. 194) #3, 12, 14, 22 and P (pg. 196) #11, 19 |
| 7/17 Thurs | Unit 8: Momentum | **#25**<br>**Lab 12:** Collisions – determine a relationship between the total momentum of objects before a collision and the total momentum of objects after a collision (consider different types of collisions: elastic, inelastic, equal mass, and unequal mass). |
| 7/17 Thurs | | **#26**<br>**Concepts:** momentum, conservation of momentum, elastic and inelastic collisions<br>**Representations:** before and after pictures<br>**Apply findings** to solve problems about colliding objects.<br>**Hmwk 12:** Chapter 9: Read pgs. 260-274. Do Q (pg. 282) #1, 8, 10 and P (pg. 284) #11, 19, 22 |
| 7/22 Tues | | **#28**<br>**Review:** Bring together ideas from previous units to solve problems involving motion (including circular motion), forces, energy, and momentum. |

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| 7/22 Tues | | **#28.2**<br>**Review:** Bring together ideas from previous units to solve problems involving motion (including circular motion), forces, energy, and momentum. |
| 7/24 Thurs | | **#28.3**<br>**Review:** Bring together ideas from previous units to solve problems involving motion (including circular motion), forces, energy, and momentum. |
| 7/24 Thurs | Final Exam | *Final Exam<br>*Bring calculator |

*Course calendar is tentative and subject to change as instructor sees fit.