**GENERAL EDUCATION – PHYS1005: The Simple Laws that Govern the Universe**

4 hours lecture; 2 credits

*Fall 2019*

*Instructor: Prof. Kai Shum – kshum@brooklyn.cuny.edu*

*Time: Monday/Wednesday 11:00 – 11:50AM and 12.50 pm – 1:40 pm*

*Reference Texts: 1. Physics Matters by J. Trefi & R. Hazen, 2007 J. Wiley & Sons*

*2. Chapters by OpenStax College (Rice University; http://userhome.brooklyn.cuny.edu/kshum)*

**Communication with class through website:*****http://userhome.brooklyn.cuny.edu/kshum***

**Bulletin Description:** The development of physics, in historical context. Applications to everyday life. Laws of universal gravitation and the conservation of energy. Examination of a topic in modern physics in which these classical concepts are transformed, extended, and/or applied. Satisfies Pathways Flexible Core Scientific World requirement (Not open to students who are enrolled in or have completed Physics 0.1 or 1100 or 1112 or 1150 or 1.6, Integrated Science 1 or Core Studies 7.2 or CORC 1331 or Physics 1331).

**Discussion:** This course takes the students through a journey that will lead to exposure to our current understanding of the Universe that is consistent with the principles of a Scientific method that are anchored on experimental observations. Students will be able to practice by working with available experimental data and demonstrate that the data are consistent with some of the key laws.

**Course Structure:** The structure of the course includes the lectures by the instructor, the demonstrations by lab instructors, and the experiments performed by students. The lectures outlined below by the instructor will provide introductions and reasons how observed events in everyday life that comprises the ways in which people typically act, think, and feel on a daily basis can be interpreted by simple physics laws. The demonstrations by a lab instructor just before student’s experiments will illustrate how physics laws can be used to predict the trace of a designed event. Finally, students will be able to perform various experiments based on the lecture materials to further digest what they have learned in lectures.

**Course Outline**:

* Week 1 – Kinematics of one-dimensional/two-dimensional (1D/2D) motion through introducing point-mass concept, coordinates, distance, displacement, speed/velocity, &inertial frames.
* Week 2 – Newton’s 1st law, two-object problems, Acceleration, and de-accretion
* Week 3 - Vertical motions with gravitational acceleration a = ± g (g = 9.8 m/s^2)
* Week 4 - 2D projectile motions
* Week 5 - Dynamics of motion: Newton’s 2nd (Fnet = ma)
* Week 6 - Review,
* Week 7 - **Exam#1**; Solutions of exam#1
* Week 8 - Gravitational force/normal force/friction force/tension,
* Week 9 - Newton’s 3rd law (action/reaction forces), concepts of systems/sub-systems
* Week 10 - Energetics of motion: kinetic energy, gravitational potential energy, thermodynamics (1st law, heat, heat-capacity, temperature)
* Week 11 - Thermodynamics (2nd law, latent-heat of evaporation/fusion), Ray-optics (mirrors)
* Week 12 - Review, Ray-optics, **Exam#2**
* Week 13 - Solutions of exam#2, Coulomb’s law/Electric field/potential, electric current/power, ohm’s law
* Week 14 - Resistors in series and in parallel; nuclear physics; Ray-optics (spherical mirror imaging)

**Learning Outcomes:**

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| Students will explain how observations support particular conclusions. |
| Students will identify questions that remain unresolved based on prior knowledge. |
| Students will use units, convert between units and work with different scales. |
| Students will learn how the scientific method and its reliance on observation and refutability are applied to gain a consistent understanding of the laws that govern the physical environment and the processes that take place there. |
| Students will perform laboratory experiments in teams weekly involving measurements, data analysis, graph plotting, calculations. Students will learn about the inherent uncertainty in the measurement process. Students will directly compare theory such as laws of motion and gravitational forces that account for the structure of the universe with simple laboratory experiments and in the process will learn that laws that govern the Universe can be tested (and refuted) in the laboratory. |

**Methods of Evaluation:** Lecture-exams (40%), lab-reports (28%), and final exam (32%).

**Electronic Tools: n/a**

**Addendum – *Required Read***

**REQUIRED-INFO-ON-COURSE-POLICIES:**Your responsibility will be to come on time, participate both individually and on the team activities, think critically, and show respect and concern toward all members of the class.

*A. Attendance Policy****:* Attendance is required as is arriving to class on-time. The class starts at 9:30am. Plan for it.**

* You are expected to be present and on-time for every class session. Material covered during every class meeting is important for learning the course content as a whole.
* Coming in late and leaving during the class session distracts your fellow classmates and the class discussions in progress. If you have to leave early, just let me know ahead of time.
* If you are regularly late, I will discuss this with you and if the problem persists, your grade may be debited.
* Although the TBL format requires regular on-time attendance, if there are any emergencies, we can discuss any special circumstances. I understand complex lives.

*B. Guidelines for Behavior in Class:*

* *Behavior toward classmates:* For the semester, we will be a community and will need to negotiate expectations for behavior to maintain an atmosphere in which all students can learn, despite personal, cultural, religious and other social differences. You will be an active part of the learning process. That means the success of the class is a shared responsibility for all of us to provide the help, collaboration and support for all in the class to benefit to the extent they participate. Each one of you is expected to demonstrate professional attitudes and behaviors during class meetings and while working on team learning assignments. Remember that each one of you will be directly and indirectly influencing others’ learning and they are influencing yours.
* *Feedback to the instructor:* if you feel I am not meeting course goals is welcomed and you will not be penalized for it in any way. I work hard on this course and I want you to succeed. If you feel there are problems with the design or delivery of the course, give me your input and we can talk about it.
* *Cell Phone Calls/Leaving the Classroom During Class:* The structure of the setting is perhaps more informal than in a traditional classroom. You may not leave class during the period unless there is a verifiable emergency of some kind. Please go to the bathroom before class (the closest bathrooms are upstairs on the first floor). It is not acceptable to leave class to take phone calls or take long bathroom breaks and you absolutely may not leave the classroom during quizzes without permission.
* *Remove Your Own Waste:* Please keep the classroom clean. Do not leave “junk” (papers, food cartons, plastic water bottles) in the classroom. There are waste baskets in the class room and in the corridor outside.

*C. Digital Technology Policy (I really hate to write this section, but it has proven necessary):*

* The only acceptable use of electronic devices during class is to access your e-textbook and to answer questions in Learning Catalytics. The use of computers, iPads, netbooks, cell phones or other electronic devices during class for any purposes unrelated to class activities is unacceptable.
* You also may not use your devices between the IRAT and TRAT phases of a class, in order to avoid having people looking up answers to the TRAT.
* You may not use laptops, tablets or cell phones for non-class-related browsing, texting, emailing, social messaging, shopping, gaming, and doing homework for other classes, etc. during class time. Selfies are out as well. Such activities not only reduce/dilute your attention to team and class discussions, but also distract me and other students. If you are using an electronic device not connected with the activities of the class, you are not participating fully in the day’s activities. I do not like to embarrass students in class, but I will call you out if you are repeatedly misusing technology during the class and I will call on frequent offenders to answer a question or contribute to a discussion or I take your device until the class is over. You have been warned.
* In the same vein, you should neither make nor answer phone calls during class.Smart phones must be turned off or set to vibrate during class. You may leave the room only in connection to a call that is about a *verifiable emergency*.

**REQUIRED INFO ON COLLEGE POLICIES AND PROCEDURES:**

*A. Class and College Academic Integrity Policies:* You are expected to adhere to College standards for academic integrity. In a class that has collaboration involved in daily class activities, it is important to understand the difference between collaboration that is allowed and encouraged, and collaboration that is a violation of academic integrity rules for the class. If in doubt for a specific assignment, ask the instructor and reference your syllabus to determine assignments where collaboration is OK and those when it is not.   
  
It is a violation of academic integrity to obtain answers to individual class quizzes or exams in any form from peers either directly with their cooperation or by looking at their answers without their knowledge, unless collaboration on the quiz or examination has explicitly been permitted and encouraged by the instructor. Plagiarism of any kind will **NOT** be allowed by College policy. Using others’ work/ideas, unless it is a collaborative assignment and so indicated by the instructor, as well as improper citing/referencing will be viewed seriously. Copying and pasting from electronic or other sources on any evaluations without attribution is not permitted.

Brooklyn College Instructors are required to include on syllabi the following statement on the University’s policy on Academic Integrity: *“The faculty and administration of Brooklyn College support an environment free from cheating and plagiarism. Each student is responsible for being aware of what constitutes cheating and plagiarism and for avoiding both. The complete text of the CUNY Academic Integrity Policy and the Brooklyn College procedure for policy implementation can be found at www.brooklyn.cuny.edu/bc/policies. If a faculty member suspects a violation of academic integrity and, upon investigation, confirms that violation, or if the student admits the violation, the faculty member must report the violation.”*

*B. Disability-Related Accommodations:*The following information about the Center for Student Disability Services is provided for any students needing accommodations to complete the work in the course:  *“In order to receive disability-related academic accommodations, students must first be registered with the Center for Student Disability Services. Students who have a documented disability or suspect they may have a disability are invited to set up an appointment with the Director of the Center for Student Disability Services, Ms. Valerie Stewart-Lovell at 718-951-5538*. If you have already registered with the Center for Student Disability Services, please provide your professor with the course accommodation form and discuss your specific accommodation with him/her.*”*

*C. Non-attendance in class due to religious beliefs: S*ee page 65 in the latest Bulletin in reference to the state law regarding non-attendance because of religious beliefs at <http://www.brooklyn.cuny.edu/web/off_registrar/2016-17_Undergraduate_Bulletin.pdf> For any days of religious observance that prevent attendance in class, students must be given “equivalent opportunity to make up any examination, study or work requirements” missed because of absence due to religious observance.

*D. Academic Regulations and Significant Dates:* Students are encouraged to familiarize themselves thoroughly with the academic regulations of Brooklyn College and CUNY in the latest online *Undergraduate Bulletin.* Dropping and adding courses, even within drop/add periods can have financial aid implications. Before you drop any courses, you should check with the Financial Aid office if you are in jeopardy of losing some or all financial aid, particularly if you would fall below 12 credits.

\*When you **drop** a course, it will not appear on your transcript. When you **withdraw** from a course, a grade of W appears on your transcript. A W grade does not count in your academic index.