

Physics and Science Fiction (Phys 0089) Spring 2021

Instructor: Hrvoje Petek

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Objectives:

The goal of this course is to provide a basic appreciation and understanding of physical science. The last year has demonstrated how science can benefit our society and how we can be harmed by ignoring scientific principles and concepts. The University of Pittsburgh considers a broad education in science and humanities to be beneficial, and therefore science is a requirement for graduation for non-science majors. The fundamental laws and principles of physics will be presented using mathematical formalism that requires familiarity with algebra, trigonometry, and some other transcendental equations. The goal is both to relate physical phenomena to our everyday experience and to provide a perspective on how physicists approach interpreting and elucidating physical phenomena. In addition to outlining the basic laws, forces, phenomena, and applications of physics, we will explore how these concepts are treated in the science fiction literature. Students will learn the underlying physics, and read short stories from science fiction literature in its historical context, in order to reinforce learning and critical thinking. By developing an understanding how science fiction literature is guided by scientific laws, or by how science fiction authors create an alternative reality by violating the precepts of physical laws, we will aim to attain a higher appreciation of physical sciences.

Students will be expected to demonstrate that they have understood and can apply the physical principles discussed in class in everyday situations that they may encounter. Creativity and initiative in discussion and introduction of relevant materials will be rewarded. You are expected to participate in classroom discussions. Your participation will be a part of your grade. The class will be web based, so the only way I can learn who you are and that you are participating in the course is if you participate in the classroom discussion,

Policies:

Class attendance and participation is required. You will be expected to have read the assigned material and to be prepared to discuss it during the class. Students will be called on randomly to answer questions based on the homework assignments. There will be a weekly homework assignment that will test understanding of concepts and the ability to apply what has been discussed. We will use the MKS units: https://en.wikipedia.org/wiki/MKS_system_of_units. Files of the lectures will be disseminated to the class by email on the day of the lecture. You will get a Zoom link shortly before each lecture to enable you to join.

Textbook:

We will use “Exploring Science Through Science Fiction” by Barry Loukkola (CMU).
<https://link.springer.com/book/10.1007/978-1-4614-7891-1>

Tentative Schedule (you will get in-lecture specific and more precise instructions):

Jan. 19 – The Scientific Method; Start Newton’s Laws of Motion; Read “The Cold Equations”

https://www.youtube.com/watch?v=o-JV_X6y4rM

Jan. 26 – Continue Newton’s Laws of Motion; Read “The Martian Way”

https://archive.org/stream/galaxymagazine-1952-11/Galaxy_1952_11#mode/2up

Feb. 2 – Newton’s Law of Gravity; Read “Neutron Star”.

<http://www.spaz.org/~jake/pix/ebooks/Larry%20Niven/Niven%20Larry%20-%20Neutron%20Star.pdf>

Feb. 9 – Conclude Classical Mechanics; Read “The Big Bounce”

<https://www.youtube.com/watch?v=YTHd3lhNuxM>

Feb. 16 – Thermodynamics and the Atomic Theory of Matter; Read “Night” and “The Last Question”

<https://www.youtube.com/watch?v=k90QVzUEXEM>

https://templatetraining.princeton.edu/sites/training/files/the_last_question_-_issac_asimov.pdf

[night_by_john_w._campbell.pdf](#)

Feb. 23 (self care day-no class) –

Feb. 25 In-class Mid-term exam

March 2 – Atomic Theory of Matter; Read “Unfinished Story #1” and “Take a Deep Breath”

March 9 – Electric Fields and Waves; Read “Mind Games” and “The Necklace”

March 16 – Electric Fields and Waves; Read “The Theory and Practice of Time Travel”

March 23 – Einstein’s Theory of Special Relativity; Read “The Theory and Practice of Teleportation” and “The Hole Man”

March 30 – Einstein’s Theory of General Relativity; Read and “No Morning After”

April 6 – Quantum Mechanics I.; Read “The Black Cloud” and “At the Rialto”

April 13 – Quantum Mechanics I + II.; Read “Matter’s End” and “All the Myriad Ways”

April 20 – Quantum Mechanics II.; Read “Tao Zero”

April 24 – Final project – You will write a story that incorporates what you have learned about Physics and Science Fiction. The story should be less than 10 pages double sided. I suggest that you communicate with me before writing to make sure that your project will fulfil the class expectations.

Grades: There will be three announced in class tests 30%; there will be weekly homework will count for 30%; final project will be 30%; class participation 10%.