

Elements of Physical Science: The Physics of Science Fiction

COURSE MEETING TIME AND PLACE:

Course Section	Meeting Time	Location
100-08	MoWeFri 10:00-10:50 am	Brandywine 011

INSTRUCTOR INFORMATION:

Dr. Shawn H. Pfeil

e-mail: spfeil@wcupa.edu (please include course information in subject line)

phone: (610) 430-4084

office: Schmucker Science South 229

OFFICE HOURS:

My scheduled office hours as of the first day of class are listed below. I reserve the right to adjust this schedule to reflect unforeseen circumstances.

Monday	Wednesday	Thursday
1:00-2:30 pm	1:00-2:30 pm	2:00-3:00 pm

Office hours are available by appointment for students with an ongoing conflict with my scheduled hours.

REQUIRED COURSE MATERIALS:

- **Exploring Science Through Science Fiction**, Barry B. Luokkala, Springer, ISBN 978-1-4614-7890-4. *This text is also available as an e-book. Please note that the book is by no means a complete introduction to introductory physics. I will be placing several traditional textbooks on course reserves, which you may want to reference. I will also be posting my lecture notes on D2L.*
- A scientific calculator. *This need not be fancy, but you will want something that can handle scientific notation, and easily deal with powers.*

COURSE DESCRIPTION:

In this special topic section of PHY100 we will critically examine the Physics in popular works of science fiction. We will use kinematics, dynamics, a little relativity, and thermal physics to analyze scenarios from film, TV, and written science fiction. In order to do this, we will have to learn a little Physics. Our main goal is to develop our quantitative critical thinking skills. As a science general education course, we also seek to develop our scientific literacy.

WEST CHESTER UNIVERSITY GENERAL EDUCATION LEARNING OUTCOMES:

This course (PHY100) is an approved general education course in the Sciences (see pg. 39 of the undergraduate catalog) and as such meets the following general education goals:

General Education Goal #2: Ability to employ quantitative concepts and mathematical methods. (Secondary Goal of Science General Education Courses)

Students will apply the quantitative and mathematical methods of physics to analyze the plausibility of situations arising in works of science fiction.

General Education Goal #3: Ability to think critically and analytically. (Primary Goal of Science General Education Courses)

Students will critically analyze works of science fiction to identify which parts of the work are plausible, and which are not.

ASSESSMENT:

I will be using the D2L grade-book feature to post course grades. Please check it periodically.

- **Module Homework Worksheets** (20%) Our textbook does not provide a lot of practice actually solving problems, so we will supplement it with a practice worksheet for each module. We will start this set of problems together in class, and you will finish it for homework. Please see the course schedule for due dates.

If your homework is late I will not accept it. I will be posting solutions online using the D2L page, and cannot accept late homework. If you will be missing a class where homework is due you must arrange to turn it in ***before*** that class meeting. If you miss a due date due to illness or some other mitigating event, then you must e-mail immediately. We can then arrange for you to turn in your assignment before I post the solutions.

- **Module Quizzes:** (55%) Each module has a multiple choice quiz assessing your ability to apply the Physics problem solving we have learned in class. These quizzes will be similar to the module homework, and will occur about one week after the corresponding homework is due. Please see the course schedule for dates.

If you miss a quiz for a University Sanctioned Event, then I will give you a makeup, but you must notify me ahead of time regarding your absence. If you miss a quiz because you are legitimately ill, then I will give you a makeup. I may ask for appropriate documentation. If you have some other reason for missing a quiz, which you think is legitimate, talk to me about it ahead of time. If I decide it is reasonable, we can work something out. *At this point in your academic career I expect you to have a sense for what is reasonable.*

- **Final Project:** (25%): You will turn in a longer critical analysis of a piece of science fiction, of your choice, but which has been pre-approved by your instructor. This analysis will include both a quantitative and qualitative components, and will be rooted in the physics learned over the semester. You will also be required to turn in drafts of this analysis earlier in the course. Please see the separate description of the final project and the course schedule.

I will be using the official WCU scale for grades, see <http://catalog.wcupa.edu/undergraduate/academic-policies-procedures/grading-information/>. However, I reserve the right to adjust the weights of individual components, or the scale to account for unforeseen circumstances.

RECURRING STRUCTURE OF THE COURSE:

The course has a recurring unit structure. Each unit has the following components:

- One to two lectures introducing a concept from Physics.
- One to two meetings where we practice applying these concepts to traditional problems.
- One to three meetings where we examine pieces of science fiction using these tools.
- A module assessment.

COURSE SCHEDULE:

This schedule is very tentative. This is the first semester we are offering this special version of PHY100. I reserve the right to adjust it, either in response to snowdays, or for other reasons.

	Day	Unit	Topic	Reading	What is Due?
01/22	M W F	Unit 1	Course Introduction Dimensional Analysis SI Units and the Size of Space	Preface vii-x	
01/29	M W F	Unit 2	Practice With Dimensional Analysis CS 1: The cost to build and operate the Death Star. Kinematics in 1D – Definitions	CH 1	
02/05	M W F		Kinematics in 1D – Relations Kinematics in 1D – Practice Unit 1 Quiz		WKS#1
02/12	M W F	Unit 3	Kinematics in 1D – More Practice CS 2: Shooting people to the moon, CS 3: Viper Launch (BSG) Time Dilation/Length Contraction I	CH 2.1,2.3	WKS#2
02/19	M W F		Time Dilation/Length Contraction II Practice with Time Dilation Unit 2 Quiz		WKS#3
02/26	M W F	Unit 4	Case Study 4: Planet of the apes (1968) CS 5: Interstellar Newton's First and Second Laws	CH 2.2	WKS#4
03/05	M W F		Types of Forces Practice with Newton's 2 nd Law Unit 3 Quiz		Proj. Proposal
03/12	M W F		SPRING BREAK SPRING BREAK SPRING BREAK		
03/19	M W F		CS 6: Starfuries and X-Wings Newton's Third Law CS 7: Independence Day CS 8: Yoda lifting the X-Wing		WKS#5
03/26	M W F	Unit 5	Circular Motion I Unit 4 Quiz Circular Motion II.		Proj. Progress Report
04/02	M W F		Practice with Circular Motion CS 9: Orbits and Starship Troopers CS 10: 2001 a Space Odyssey & B5		

04/09	M W F	Unit 6	Thermal Physics Specific Heat and Latent Heat Unit 5 Quiz	CH 3.1-3.5	WKS#6
04/16	M W F		Practice Thermal Physics CS 11: Light Sabers CS 12: Melting Alderaan		Proj. Rough Draft
04/23	M W F	Unit 7	Energy and Power Energy and Power Unit 6 Quiz	CH 3.7	WKS#7
04/30	M W F		Practice with Energy and Power CS 13: Antimatter Bombs CS 14: Orbital Bombardment		WKS #8 Due Proj. Final Draft
05/11	F		Unit 7 Quiz, during final period[†]		

[†]Our final period is from 8-10 am, but since we will be working on a 50 minute quiz, we will meet at 9 am.

ELECTRONIC DEVICE POLICY:

The pace of the course is such that your undivided attention will be required for the entire lecture and lab period. Please set all electronics to silent or “vibrate mode” and put them away. Both you and your neighbors will be able to concentrate on the material at hand. ***If you plan on recording any lecture please see the intellectual property statement.***

D2L:

We will be using D2L (<https://d2l.wcupa.edu/d2l/login>) for this course. I will be posting lecture notes, problem solutions, etc. Please make sure to check D2L frequently. I will also be using the D2L gradebook feature, which will allow you to check your grade in the course at will.

ATTENDANCE POLICY:

Attendance is taken for this course. Attending lecture, while highly correlated with success in this course is not graded.

ACADEMIC & PERSONAL INTEGRITY

It is the responsibility of each student to adhere to the university’s standards for academic integrity. Violations of academic integrity include any act that violates the rights of another student in academic work, that involves misrepresentation of your own work, or that disrupts the instruction of the course. Other violations include (but are not limited to): cheating on assignments or examinations; plagiarizing, which means copying any part of another’s work and/or using ideas of another and presenting them as one’s own without giving proper credit to the source; selling, purchasing, or exchanging of term papers; falsifying of information; and using your own work from one class to fulfill the assignment for another class without significant modification. Proof of academic misconduct can result in the automatic failure and removal from this course. For questions regarding Academic Integrity, the No-Grade Policy, Sexual Harassment, or the Student Code of Conduct, students are encouraged to refer to the Department Undergraduate Handbook, the Undergraduate Catalog, the *Ram’s Eye View*, and the University website at www.wcupa.edu.

STUDENTS WITH DISABILITIES

If you have a disability that requires accommodations under the Americans with Disabilities Act (ADA), please present your letter of accommodations and meet with me as soon as possible so that I can support your success in an informed manner. Accommodations cannot be granted retroactively. If you would like to know more about West Chester University's Services for Students with Disabilities (OSSD), please visit them at 223 Lawrence Center. The OSSD hours of Operation are Monday – Friday, 8:30 a.m. – 4:30 p.m. Their phone number is 610-436-2564, their fax number is 610-436-2600, their email address is ossd@wcupa.edu, and their website is at www.wcupa.edu/ussss/ossd.

EXCUSED ABSENCES POLICY FOR UNIVERSITY-SANCTIONED EVENTS

Students are advised to carefully read and comply with the excused absences policy for university-sanctioned events contained in the WCU Undergraduate Catalog. In particular, please note that the “responsibility for meeting academic requirements rests with the student,” that this policy does not excuse students from completing required academic work, and that professors can require a “fair alternative” to attendance on those days that students must be absent from class in order to participate in a University-Sanctioned Event.

REPORTING INCIDENTS OF SEXUAL VIOLENCE

West Chester University and its faculty are committed to assuring a safe and productive educational environment for all students. In order to meet this commitment and to comply with Title IX of the Education Amendments of 1972 and guidance from the Office for Civil Rights, the University requires faculty members to report incidents of sexual violence shared by students to the University's Title IX Coordinator, Ms. Lynn Klingensmith. The only exceptions to the faculty member's reporting obligation are when incidents of sexual violence are communicated by a student during a classroom discussion, in a writing assignment for a class, or as part of a University-approved research project. Faculty members are obligated to report sexual violence or any other abuse of a student who was, or is, a child (a person under 18 years of age) when the abuse allegedly occurred to the person designated in the University protection of minors policy. Information regarding the reporting of sexual violence and the resources that are available to victims of sexual violence is set forth at the webpage for the Office of Social Equity at <http://www.wcupa.edu/admin/social.equity/>.

EMERGENCY PREPAREDNESS

All students are encouraged to sign up for the University's free WCU ALERT service, which delivers official WCU emergency text messages directly to your cell phone. For more information, visit www.wcupa.edu/wcualert. To report an emergency, call the Department of Public Safety at 610-436-3311.

ELECTRONIC MAIL POLICY

It is expected that faculty, staff, and students activate and maintain regular access to University provided e-mail accounts. Official university communications, including those from your instructor, will be sent through your university e-mail account. You are responsible for accessing that mail to be sure to obtain official University communications. Failure to access will not exempt individuals from the responsibilities associated with this course.

PHYSICS TUTORING:

Physics tutoring is available through LARC (610) 436-2535. In the past peer tutoring has also been available from SPS (the Society of Physics Students). If SPS tutoring becomes available this semester I will make an

announcement. **These should be considered in addition to my office hours, which are the first place you should stop for additional help.**

INTELLECTUAL PROPERTY STATEMENT:

I, the instructor, utilize copyrighted materials under the “Freedom and Innovation Revitalizing the United States Entrepreneurship Act of 2007” (Fair Use Act). Apart from such copyrighted materials, all other intellectual property associated with this course is owned and copyrighted by the instructor, including, but not limited to, lectures, course discussions, course notes, slides, assessment instruments such as exams, and supplementary materials posted or provided to students authored by the instructor. No recording, copying, storage in a retrieval system, or dissemination in any form by any means of the intellectual property of the instructor, in whole or in part, is permitted without prior written permission of the instructor. When such permission is granted, it must specify the utilization of the intellectual property and all such permissions and waivers shall terminate on the last day of finals of the semester in which this course is held.

ALL OTHER ACADEMIC POLICIES

For any university wide academic policy not explicitly covered in this document, such as No Grade policies. Please consult your major advising handbook, the Undergraduate Catalog, the Ram’s Eye View, or the University Website.