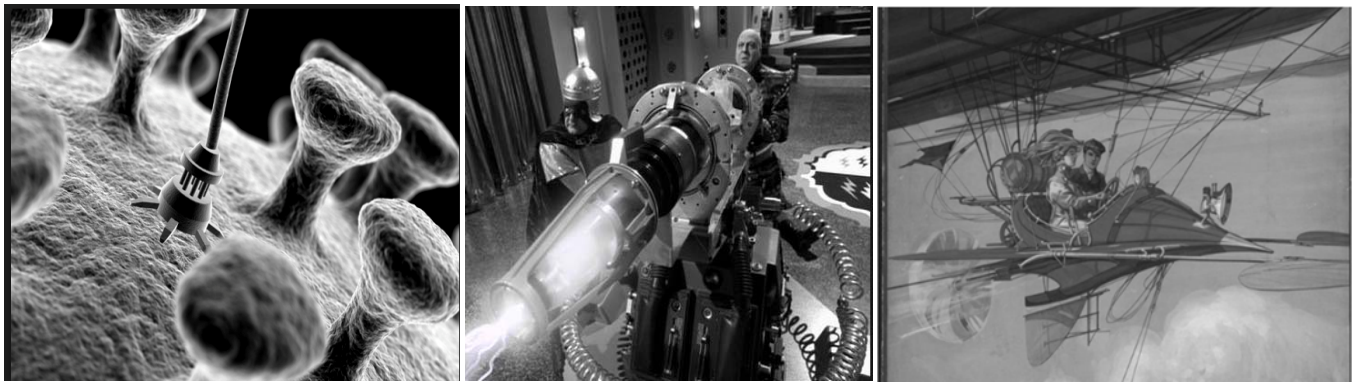
English 2420: Science Fiction
(Interdisciplinary Designation)

The Physics of Science Fiction



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Course Description

This interdisciplinary course examines science fiction texts from a physics perspective, focusing on both the long and short-term ability of science fiction to inspire and give ethical boundaries to otherwise abstract modeling of theoretical physics. In turn, the course will also demonstrate how the field of physics historically informed the development of science fiction and culture. Significant themes and trends in the futuristic worlds of science fiction, such as airlocks, nanotechnology, production and use of gravity wells, and planetary centrifugal forces will be discussed alongside the ways that private industry, government, and global scientific communities approach the politics of envisioning the future.

•Prerequisites: ENGLISH 1101

General Education Student Learning Outcomes

Students will be able to:

- Use the arts, sciences and humanities to study of values, ethical principles, and the physical world.
- Communicate in diverse settings and groups, using written (reading and writing), oral (speaking and listening), and visual forms (projected presentations)
- Obtain meaning from experience, as well as gather information from observation.
- Transform information into knowledge, and knowledge into judgment and action.
- Apply knowledge and analyze social, political, economic, and historical issues.
- Demonstrate expanded cultural and global awareness and sensitivity.
- Discern multiple perspectives.
- Acquire tools for lifelong learning—how to learn, how they learn, knowledge of resources.
- Work with teams, including those of diverse composition. Build consensus

Instructional Objectives, Activities, and Assessment

Instructional Objectives: *For the successful completion of this course, students should be able to:*	**Instructional Activities**	**Assessment**: *Evaluation methods and criteria*
Communicate ideas clearly using written and oral means	Journal entries, short essay, research proposal	Written feedback and use of grading rubric (critical response, development, structure, language, and grammar and usage)
Purposefully connect and integrate across-discipline knowledge and skills to solve problems	Theoretical and material physics modeling, application to literary study	Short quizzes on formula application and extrapolation
Synthesize and transfer knowledge across disciplinary boundaries	Readings, lectures, discussions, and journaling	Written feedback and use of grading rubric (critical response, development, structure, language, and grammar and usage)
Apply integrative thinking to problem solving in ethically and socially responsible ways	Modeling of equations related to readings, discussion of technological and cultural impact of futurism	Short quizzes on formula application and extrapolation, midterm and final exam
Gain comfort with complexity and uncertainty	Readings, discussions of short film clips, short in-class writing assignments, and applied theoretical modeling, all on unknown/untested technologies and futures	Participation, creative response, and accuracy of formula application
Think critically, communicate effectively, and work collaboratively	Collaborative group presentation and informal classroom activities	Oral and written feedback and use of grading rubric (visual effectiveness, slideshow development, distribution of workload); peer-to-peer evaluation of group members' contributions

Teaching and Learning Methods

- Discussions and lectures
- Readings, multimedia, and films
- Individual and collaborative projects
- Student presentations
- Quizzes / Reading Responses

Assignments

- Participation, Journal Entries, and In-Class Quizzes (35%)
- Short Essay (10%)
- Midterm Exam (10%)
- Research Proposal (15%)
- Group Presentation (15%)
- Final Exam (15%)

Core Course Materials (all are out of copyright and available for free online **unless in bold**)

Asimov, Isaac, *The End of Eternity* (1955)(free online)
Bradbury, Ray, "There Will Come Down Soft Rains" (1950) (pdf available on OpenLab)
Doyle, Arthur Conan, *The Disintegration Machine* (free online)
Robert Heinlein's *Waldo* (1942) (ed. tbd)
Jerry Pournelle "He Fell into a Dark Hole" (1973) (ed. tbd)
David Snoke, Physics and Science Fiction (pdf available on OpenLab)
Charlie Stross, *Accelerando* (2005) (free online via creative commons)
Tolstoy, Aleksey Nikolayevich. *The Garin Death Ray* (1927)(free online)
Jules Verne's *Robur the Conqueror* (1886) (free online)
---. 20,000 Leagues Under the Sea (1869) (free online)
Wells, H.G. *The War in the Air* (1908) (free online)
---. *The Truth About Pyecraft* (free online)
---. *Time Machine* (free online)
Kaku, Michio *Hyperspace: A Scientific Odyssey Through Parallel Universes, Time Warps, and the Tenth Dimension. New York: Anchor Books, 1995. Print.*
---. *Physics of the Impossible: A Scientific Exploration into the World of Phasers, Force Fields, Teleportation, and Time Travel. New York: Doubleday, 2008. Print.*
***Conceptual Physical Science*, 5th Edition, Hewitt, Suchocki and Hewitt, Pearson Addison Wesley Publishing.**

Essays/Assignments
•Journals will be collected periodically for scoring.

•Quizzes will be administered during the first ten minutes of class and cannot be made up.

•All assignments should be legible, organized, dated, and numbered.

•You will be responsible for peer review during class, which means that you will listen to the work of other students and offer meaningful feedback to help them make their essay as effective as possible. Preparedness for and participation in these peer review sessions will account for the bulk of your Active Participation/Attendance grade. If you do not bring a complete draft of your essay to the peer review workshop, you will receive a "0" for the workshop.

•All of your writing should be grammatically correct and free of spelling errors, and it should demonstrate increasingly complex critical thinking as the semester progresses. If this is a challenge for you, we encourage you to visit our office hours and the Learning Center for help throughout the semester.

Course Schedule

Outline is based on class meeting one (1) time each week.

1. Joint introduction, OpenLab Access, definitions of "Science Fiction" & "Physics," scientific method, basic ideas and terms, particulars v. universals, read Snoke (7-13)
HW: sign up for OpenLab, Journal Entry #1

2. Reading science fiction as literature, reading science fiction v. science as discourse network, gravity, the universal law of gravity
HW*:* read Verne's *Robur the Conqueror* (sel.), Lowell Howell Morris's "Islands in the Air" (1929) (online), Alan Lovegreen's "Aerial Homesteading: Aerofuturism in Interwar America" (2015), Journal Entry #2

3. Gravity and distance, the inverse-square law, weight and weightlessness, Short Essay prompt
HW: Journal Entry #3, Short Essay invention work, read sel. from H.G. Wells, *"The Truth About Pyecraft"*

4. The science fiction and physics of black holes, dying suns, sel. from *Event Horizon* (1997), "Heat Death of SF?" as a way of reading narrative (Hewitt) + Darko Suvin's idea of cognitive estrangement via *novum*
HW: Pournelle's "He Fell into a Dark Hole," H.G. Wells's *Time Machine* (sel.), read sel. from Asimov, *The End of Eternity,* Journal Entry #4, complete Short Essay first draft, sel. from Kaku, *Physics of the Impossible. A Scientific Exploration into the World of Phasers, Force Fields, Teleportation, and Time Travel,* Doubleday, New York

5.Teleportation, hovercraft, and force fields, bodies compromised & displaced, peer review of Short Essay, sel. from Kaku's *A Scientific Odyssey* and *Physics of the Impossible.*
HW: view film sel. from Star Trek "beam me up" & "shields up," and Star Wars landspeeders, Journal Entry #5

6. The oceans in 19th c. science fiction, overview of 20,000 Leagues
HW: read sel. from Jules Verne's 20,000 Leagues Under the Sea, Journal Entry #8

7. Density, pressure, buoyancy in a liquid, Archimedes' Principle, atmospheric pressure, Pascal's Principle, Bernoulli's Principle
HW: Journal Entry #9, Ray Bradbury "There Will Come Down Soft Rains"

8. Discussion of electric field, magnetic field, electromagnetic field and levitation, midterm review
HW: Journal Entry #6, prepare for midterm, submit final draft of Short Essay

9. Midterm, identify Presentation Groups, vibrations and waves, wave motion, transverse and longitudinal waves
HW: construct presentation proposals on OpenLab, SF text on sound waves **TBD**, Journal Entry #7

10. The atomic era in culture and science fiction, the atomic nucleus and radioactivity, radioactivity, radiometric dating, nuclear fission, mass-energy equivalence: E=mc2, read sel. from Doyle, *"The Disintegration Machine"*
HW: Journal Entry #10, identify Research Proposal topic

11. Introduction to quantum physics. Lasers. Tolstoy, sel. from *The Garin Death Ray*

11. Introduction to nanotechnology, nanorobots, and all things nano
HW: watch Feyman's "There's plenty of Room at the Bottom" (1959), read sel. from Robert Heinlein's *Waldo* (1942), read intro. from Colin Milburn's *Nanovision: Engineering the Future* (2008), Journal Entry #11, read sel. from Kaku, *Physics of the Impossible*

12. Nanotechnology, nanofinger modeling, film screening of *Transcendence (2014)*
HW: Journal Entry #12, sel. from Stross's *Accelerando*, complete first draft of Research Proposal

13. Opening scene of *G.I. Joe: Rise of Cobra (2009)* and sel. from *Antman* (2015). Discussion of the technological Singularity, peer review of Research Proposal
HW: Journal Entry #13, post Group Presentation final version on OpenLab, read sel. from Kaku, *Physics of the Impossible.*

14. Group presentations, final essays due, review for final exam
HW: prepare for Final Exam, complete Research Proposal

15. Final Exam, Research Proposal final draft submitted, remaining group presentations