**Physics of Energy Syllabus**

**Instructor**: Scott Dodelson ([sdodelso@andrew.cmu.edu](mailto:sdodelso@andrew.cmu.edu)) 7325 Wean Hall

**Schedule**: T-Th, 10:30-11:50

**Office Hours:** TBD

**Textbook**: *The Physics of Energy*, Jaffe and Taylor

**Course Rationale**

One of the most challenging problems facing humanity is satisfying the growing energy needs of world without disrupting the delicate balance that allows life to exist on Earth. Understanding this challenge and finding solutions requires an understanding of the basic science. The textbook is a comprehensive view of all things energy-related. Neil deGrasse Tyson writes, “If your task was to jump-start civilization, but had access to only one book, then *The Physics of Energy* would be your choice.” This course will make use of the text, building on basic physics to enable students to understand and contribute to issues ranging from energy sources to global climate.

**Course Description**

The course will follow the basic structure of the book, which is divided into 3 parts:

1. Basic Energy Physics (4 weeks)
2. Energy Sources (6 weeks)
3. Climate (4 weeks)

Week 1: Overview and Mechanical energy

Week 2: Electromagnetic and Thermal Energy

Week 3: Heat Transfer

Week 4: Quantum Mechanics

Week 5,6: Nuclear Energy

Weeks 7, 8: Solar Energy

Week 9: Ocean and Wind Energy

Week 10: Fossil Fuels

Week 11: Atmospheric Physics and Greenhouse Effect

Week 12: One-Dimensional Climate Modeling and the impact of Radiative Forcing

Week 13: Global Energy Flow

Week 14: Carbon Cycle

**Course Goals**

Upon completion of this courses, students will understand

* The different forms of energy
* How heat and energy are transported
* The source of energy (solar, nuclear, wind, fossil fuels); how extensive the resources are; how to extract them; and the costs of using them
* The basics of climate modeling

**Evaluation of Student Performance**

There will be weekly homework assignments (40% of the grade); one midterm (15%); one project (15%); and a final exam (25%). The remaining 5% will be given for class participation.

**Collaboration Policy**

* You are encouraged to work together on the homeworks and the project.
* You must work alone on the exams.
* The homework you hand in must be your own work, so you can work through the problems with classmates, but you must write up the work yourself.
* You can consult the internet to look up numbers and facts but not to search for answers to the problems.

**Accommodations for Students with Disabilities**

If you have a disability and have an accommodations letter from the Disability Resources

Office, I encourage you to discuss your accommodations and needs with me as early in the

semester as possible. I will work with you to ensure that accommodations are provided as

appropriate. If you suspect that you may have a disability and would benefit from accommodations but are not yet registered with the Office of Disability Resources, I encourage you to contact them at [access@andrew.cmu.edu](mailto:access@andrew.cmu.edu).

**A Final Note**

Take care of yourself. Do your best to maintain a healthy lifestyle this semester by eating

well, exercising, avoiding drugs and alcohol, getting enough sleep and taking some time to

relax. This will help you achieve your goals and cope with stress. We all benefit from support during times of struggle. You are not alone. There are many helpful resources available on campus and an important part of the college experience is learning how to ask for help. Asking for support sooner rather than later is often helpful.

If you or anyone you know experiences any academic stress, difficult life events, or feelings

like anxiety or depression, we strongly encourage you to seek support. Counseling and

Psychological Services (CaPS) is here to help: call 412-268-2922 and visit their website at

http://www.cmu.edu/counseling/. Consider reaching out to a friend, faculty or family

member you trust for assistance in getting connected to the support that can help you

through challenging periods.