ESS 102 Research Paper

Rough Draft Due Date: Friday, January 26, 2018
Final Draft Due Date: Thursday, February 1, 2018

Instructions:
1) At the beginning of the paper, include a one paragraph synopsis of your scientifically accurate sci-fi paper (see separate document for full description). The paragraph must name the major technology and science concepts that will be explained in the paper, as well as provide a summary of the plot or storyline of the sci-fi paper.
2) Choose one topic from those named in your synopsis paragraph. You will research the topic and write a research paper. Your research paper should not include personal opinion. The paper should be about five pages in length and use a 10-12 pt. font with 1.5 spacing. It may include pictures but no more than 1 picture per page. Each picture and caption should not take up more than 20% of the page. ***If you do not choose one of the topics below, you must get prior approval from your TA or instructor for your topic choice.***

Grading:
Your grade is based on your scientific accuracy and writing – Science: 13/30, Referencing: 7/30, Writing Quality: 10/30. Plagiarism will not be tolerated and will result in a referral to the Dean's office. *An Overall grade greater than 65% and a Writing Quality grade greater than 50% is required to continue in the Writing Credit track.*

Rough Draft:
You must participate in the peer review and receive feedback to receive full credit.

Referencing:
Your paper MUST include a work cited page that includes all of the resources you used in writing the paper. In addition, throughout the paper your facts MUST include a reference to where that information came from. Plagiarism will not be tolerated. For details of how to reference and examples see "Citing References in Scientific Papers" located on the course website. Encyclopedias, including Wikipedia, are ***not*** appropriate sources to cite; however, they can be used for figures or to find more appropriate sources. Direct quotes may ***not*** be used in this paper.

Example Topics and Talking Points:

1. **Space Debris:** Debris in orbit around the Earth is a growing problem for all countries interested in protecting their infrastructure in space. The magnitude of this problem increased by 50% in 2007 when the Chinese government intentionally destroyed one of their own satellites and when the Iridium and retired Russian satellite collided two years later. Why is space debris a problem? Where is it a problem? How are we tracking space debris? What potential solutions are being discussed to remove debris from orbit? Will this problem only get worse as more countries gain access to space?
2. **Robotic Mission(s):** Investigate one or more robotic missions that visited a planet, moon, or other body within the solar system (sun, comets, asteroids…) and how the technology has advanced since the mission and how it may potentially advance in the

future. What scientific questions was this probe trying to answer? What new information did scientists learn from data gathered from this probe? What questions still remain? Did the mission have technical challenges that required new technology? If so, what new technology was developed and how did it work?

3. **Commercializing Low Earth Orbit (LEO):** In recent years, there have been many new companies on the scene that are interested in turning space into a business. Also, NASA has developed a program, Commercial Orbital Transport Services (COTS), to help businesses develop technology that can be used to service the International Space Station. Choose two companies and describe their business. What technology are they developing? What is the timeline for implementation? Do they have hardware constructed? Discuss the potential market for these businesses.
4. **Space Hazards:** With this topic, you will research NEOs (Near Earth Objects). You should describe what NEOs are, what some NEOs that have hit the Earth, what is the probability that NEOs will hit Earth in the future, and what is being done to find NEOs. You should also discuss the pros and cons of some potential methods to deal with NEOs.
5. **Effect of Long Term Space Flight:** We are learning that the human body goes through changes in a microgravity environment, including loss of muscle mass, bone microfractures, and a reduction to immune system effectiveness. Describe the potential dangers. What research is being done? What potential solutions exist or are being studied to mitigate these dangers?
6. **Radiation Exposure for Astronauts:** Radiation is a problem for astronauts on a long term trip to Mars. What type of radiation is harmful in space? What kind of dose do astronauts receive? What is NASA doing to study the radiation environment? What research is being done to design protect systems for astronauts.
7. **Space Habitability:** When we discuss orbital mechanics, you will learn that astronauts traveling to Mars would not be able to stay for only a couple days like the Apollo astronauts did at the Moon. The Martian astronauts will need to spend at least a year in space. Is it possible to take all necessary supplies (water, air, food) or will they need to produce those during the mission? What will they need to produce? What technologies are being developed to make long-term space travel habitable for humans? What are the limitations of the technologies?
8. **Space Weather:** Later in the course, we will discuss the interaction of the solar wind and other solar plasma with the Earth's magnetosphere. In this paper, describe these interactions. What effects does this have on the Earth's magnetosphere? What effects does this have on the surface of the Earth and to our technology? *Since we will discuss aurora in detail in lecture, please focus your paper on some other phenomena.*