

First Year Seminar Application for Fall 2014

1. General Information

Name: Gregory Rudnick

Position: Associate Professor

Department: Physics and Astronomy

Proposed Seminar Title: The Big Questions: Understanding the Origin, History, and Fate of the Universe

2. Course Description

This course will address the discipline of cosmology, which is the study of the origin, structure, and evolution of the Universe. The big questions in cosmology that this seminar will address are: How did the Universe begin? What is the structure of the Universe? What is the Universe made of? How was all matter created? How has the Universe evolved over the last 13.5 Billion years? What is our place in the Universe? What is the future of the Universe? The compelling nature of these questions is highlighted by the award of multiple Nobel Prizes in cosmology in recent years, in topics similar to the ones outlined above. As they relate to our deepest origins, these questions have motivated great thinkers since the dawn of time and continue to fascinate the public today. Students in this class will gain a newfound appreciation for our knowledge of the Universe and benefit by the chance to bring the immense scale of the Universe, in both space and time, into the classroom and in terms that they can relate to.

3. FYS Learning Outcomes

The historical and current development of cosmology offers an excellent venue for developing critical thinking skills. As technology has developed, our view of cosmology has experienced a commensurate change. Understanding the development and rejection of theories will allow the students to practice and develop skills in critical thinking, the synthesis of multiple concepts (e.g. the different behaviors of gravity and light), evaluation of arguments, the scientific method, and the conflict of science vs. pseudoscience. Part of the class will be devoted to assessing claims about cosmology in the popular media and students will therefore have a chance to seek out and evaluate information resources. Students will also communicate their knowledge: on a daily basis through class discussions, on a regular basis through class writings, and via a capstone assignment and presentation.

4. Integrative assignment

The main method for assessment will be a scaffolded writing assignment coupled with an in-class presentation. The students will be able to choose the focus of their assignment from among one of the three topics: a recent development in modern cosmology, an open cosmological question, or a historical aspect of the development of the modern cosmology. Students will be required to synthesize, critically evaluate, and compare and contrast multiple information resources. They will need to frame these in the context of the course material and draw independent conclusions. The scaffolded assignments will explicitly address elements of the final assignment such as, how to conduct a literature search, how to compare articles, and how to assess the validity of arguments. Each scaffolded element will add a specific piece of the final capstone assignment. Each scaffolded element and the final project will be graded with a rubric that will be provided to the student in advance. These rubrics will be based on those I have developed in collaboration with the KU writing center for use in other classes of mine. The students will practice their oral presentation skills by having chances throughout the semester to present their project components in in-class presentations. Depending on the final enrollment, I

may decide to use a peer evaluation tool, such as SWORD, that lets the students see and evaluate each other's writing.

5. Additional Course Features

As I have done in the past, I will collaborate with Erin Ellis at the Library to help the students understand literature searches and the possible pitfalls in trying to find reliable sources. In addition I will use my contacts at UMKC to arrange a visit to the Linda Hall Library to show the students original texts on Astronomy and Cosmology from, e.g. Newton, Galileo. This will be a unique chance to gain access to a world class resource for studying the history of science.

Finally, given the constant tension in the United States, and especially in Kansas, as to the role of science in society, and even the meaning of science, it is critically important that our students learn the scientific method and how we have come to know an astonishing amount about the nature of our Universe, on scales far larger than any of them have ever imagined.