

# **Syllabus: ISC6416 FALL 2020 MONDAYS Noon to 1 PM. Prof. MJ Soileau (Swallow), CREOL A219, 4070443-3808, mj@ucf.edu.**

## **ISC6416 History of Physical Science and Cultural Connections**

This course is designed for graduate students in science, engineering and math who wish to know something about the “who, how, why, when and where” of physics. It assumes they know something of the “what” of physics in order to be graduate students. I trace the developments leading to today’s physics considering when and where they happened, who took part, what they contributed to our thinking processes and how the work led to other discoveries. I also look at the impacts science had on society and conversely, how societies affected their science. There will be a discussion of ethical problems that a scientist/engineer might encounter.

**Credit hours** 1.0

### **Topics**

1. Discussion of what is science, what is a culture, what is the Culture of Science, what are scientific ethics, what can go right/wrong – some comments on fraud and pathological science.
2. How did science get started?
3. The Copernican Revolution and the Newtonian Synthesis
4. Scientific Controversies
5. Conservation Laws, Thermodynamics and the Arrow of Time
6. Electricity, Magnetism and Electromagnetics – Maxwell, Symmetry and Unification
7. Measurement, Relativity, Einstein and Everything Else
8. Quantum Mechanics – Part I
9. Quantum Mechanics – Part II
10. Quantum Mechanics – Part III
11. Five Experiments that Define Modern Optics
12. Time and the Past and Future Histories of the Universe
13. The Miracle of Stars and Why We Are
14. Patents and Intellectual Property Issues

One of the great issues in science is weapons related research. This is exemplified by the development of nuclear weapons during World War II. To study this issue, one evening we will view and discuss the play “Copenhagen” which deals with Werner Heisenberg’s visit to Niels Bohr during the Nazi occupation of Denmark and the conflicts both experienced. We will also view and discuss a dramatization of the court fight between Intelligent Design and Science entitled “Judgment Day”.

Given the social/political climate in the USA today we discuss our roles and responsibilities in our modern world. The list above already consumes one day a week class each and then some. Thus,

please be mindful of the current climate and insert ideas, opinions, questions, etc. that might suggest themselves as we go along. We have a specific class about controversies but we will see that controversy always accompanied the advancement of science.

Given external inputs we may change the order of the above topics a bit. For example, the movement of Mars in the night sky is probably one of the most significant (and controversial) observation, for millennia, in the development of science. This movement, called retrograde motion, is happening now. With the aid of a cell phone you can probably see this motion for yourself NOW.

Lastly, please let me know if one or more of these topics are of special interest, and feel welcome to steer the conversation in a direction that is more interesting to you.

#### Term Assignments.

1. How to recognize intelligent extraterrestrial life. A short essay due Wed. Aug 26, 2020. You must turn this in to satisfy your enrollment conditions for financial aid. Format can be a short essay, or a description of a test that you would propose to determine if living creatures are intelligent, sentient beings, either that we encounter or that decide to visit us.
2. Less than 500 word op ed or review of the play Copenhagen.
3. Less than 500 word op ed of review of the play Intelligent Design.
4. A final critique of the course with your suggestion for improvement, exclusion, or inclusion going forward. Less than 500 words.
5. Class participation. Enrollment is limited but do not let me monopolize the conversation! Interrupt, question, argue (with civility of course!), or participate in some way.  
Course grade will be determined by 1-5. **My expectation is that everyone will earn an A.**