ISC 6416 Special Topics:
The History of Physics, Cultural Connections and Other Issues

(1 credit hour.)

Spring 2016 Tuesdays, 12 noon – 1:15 pm.

Michael Bass
Professor Emeritus
College of Optics and Photonics/CREOL/FPCE
University of Central Florida
Orlando, FL

This course is designed for 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 science 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 discussions of ethical problems that a scientist/engineer might encounter.

The topics will include:

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, Pathological Science and Science Righting Itself
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. Magic Numbers Make the Universe: The Miracle of Stars and Why We Are
14. The Modern World- We Owe it to Physics

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".

Recommended Readings:

"Seven Ideas That Shook the Universe", Nathan Spielberg and Byron D. Anderson (John Wiley & Sons, New York, 1995) ISBN 0-471-30606-1

"The Day the Universe Changed", James Burke, (Little Brown and Co., Boston 1995) ISBN 0-316-11704-8

"Connections" James Burke, (Little Brown and Co., Boston 1978) ISBN 0-316-11681-5

"The Second Creation", Robert P. Crease and Charles C. Mann (MacMillan Publishing Co., New York 1986) ISBN 0-02-084550-2

"A Brief History of Time: From the Big Bang to Black Holes" Stephen W. Hawking (Bantam Books, London 1988) ISBN 0-553-05340-x

"The Search for Solutions", Horace Freeland Judeson (Holt, Rinehart and Winston, New York 1980)

"Stephen Hawking's Universe", John Bolough (Avon Books, New York 1985) ISBN 0-380-70763-2

"Beyond Einstein", Michio Kaku and Jennifer Trainer (Bantam Books, New York 1987) ISBN 0-553-34349-1

"Paradigms Lost", John L. Casti (William Morrow and Co., Inc., New York 1989) ISBN 0-688-08131-2

"Black Holes and Time Warps", Kip Thorne (W. W. Norton Co., Inc., New York 1994) ISBN 0-393-31276-3

"Time's Arrows: Scientific Attitudes Toward Time". Richard Morris (Simon & Schuster, Inc., New York 1986) ISBN 0-671-50158-5 or 0-671-61766-4 Pbk.