

The SHU Common Core Curriculum: The Human Journey “The Human Community and Science Discovery”

Physics CC 103: *The Journey in the Physical Universe*

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COURSE DESCRIPTION

As part of the Sacred Heart University’s **Common Core: The Human Journey** curriculum, this course will address the four fundamental questions of human meaning and value from the perspective of the academic disciplines of *Physics* and *Theology*. We will examine Physics as a fundamental and practical human endeavor which helps us understand and appreciate the natural world as part of God’s provision and revelation for us. As with all of the courses that make up the Common Core, the four fundamental questions will serve as the threads that will provide the framework for the fabric of the course. These questions are:

What does it mean to be human?

What does it mean to live a life of meaning and purpose?

What does it mean to appreciate and understand the natural world?

What does it mean to forge a more just society for the common good?

PYCC 103 will examine the relationships between our human explorations of the universe through science, in general, and physics, in particular. These explorations will help us develop our awareness and meaningful understanding of the universe as a whole, and of our place and responsibilities within it. Our examination will be seen through the lens of the human desire **to know** about God’s creation, as reflected in the Catholic Intellectual Tradition. Along with consideration of the ongoing interaction between faith and reason, this Tradition of academic excellence will be characterized by the use of methods of rigorous intellectual inquiry, a search for truth, and openness to scientific and theological ideas. Physics offers a rich platform for consideration of a wide range of expressions of human curiosity about the way in which the physical universe functions. We are able to use that understanding to inform our faith, and faith to inform our understanding. The applications of the knowledge gained in our pursuit of understanding of the universe has the potential to provide a portion of that sense of insight, meaning, value and purpose we desire to have. We pursue this through the exercise of inquiry, and the satisfaction of our human curiosity. Our decisions regarding the application of our knowledge can serve to improve our personal and societal well-being, provided intelligent choices for knowledge applications that are made. Wise stewardship of that which we have been given will be supported by knowledge of the natural and technological resources available to us.

CLASS MEETINGS:

SCHEDULE: We will meet on Mondays from 11:00 – 12:15 & Wednesdays from 12:30 – 1:45

LOCATION: In-class seminars and discussions will be held in SC 105A on both Monday & Wednesday

FACULTY COMMUNICATION AND OFFICE HOURS:

Dr. Wesney’s contact information: email address: wesneyj@sacredheart.edu
telephone number: (203) 943-2175

Dr. Wesney’s Office Hours: Currently, I do not have an “office” assignment, but will be glad to meet with any student by appointment at a mutually agreed upon time and location, either on-campus, or in a public location in Southwestern Fairfield County if that would be more convenient. Contact me to make arrangements for direct consultation as needed.

COURSE OBJECTIVES & OUTCOMES:

Through this course students will be able to demonstrate the use of aspects of the Catholic Intellectual Tradition to gain:

1. an understanding of the ways in which we have historically altered our view of the physical universe through the applications of the methods of scientific reasoning, and the ways that these views have informed our understanding of God and His Creation.
2. the ability to examine how the ways in which our understanding of the interaction of physics and faith provide us with the keys to help us realize what it means to be human.
3. insight into the way in which an understanding of the physical universe, in the context of faith, can help people enhance their ability to live deeper lives of meaning and purpose.
4. an increased appreciation and understanding of the natural world as seen from the frame of reference of the sciences, particularly as seen in the context of physics and astronomy.
5. a realization that the ways in which we choose to utilize our knowledge of the physical universe, and to apply the technology derived from that knowledge to meeting human needs, is a reflection of wise stewardship involving the interaction of faith, knowledge and reason to serve the common good.

COURSE REQUIREMENTS:

- (10%) All Common Core students are required to **attend** at least 2 Colloquia, **and report** on the knowledge and understanding gained as that relates to the four fundamental questions and the five course objectives & outcomes.
- (10%) Participate in **all** in-class seminar discussions, demonstrations and observation activities. Short written summaries may be required for some of these, reflecting what was learned and the relationship to the four Fundamental Questions and the five Course Objectives & Outcomes. On-time attendance is expected for **all** classes.
- (20%) Complete **all** out-of-class readings, viewings and exercises assigned, and be prepared to discuss, inquire and share insights related to these during the in-class seminars. Prepare short, written summaries, reflections and/or reactions when called for periodically throughout the course. Readings will be assigned from the books from the "Required Texts" list (below): Francis S. Collins, **The Language of God**; John Polkinghorne, **Quantum Physics and Theology**; Ian G. Babour, **When Science Meets Religion**; Hugh Ross, **Why the Universe is the Way It Is**; Krista Tippitt, **Einstein's God**; selected passages from the **Bible**; and selected short articles from various print and on-line sources. Viewings will be assigned from a variety of multimedia sources listed below.
- (20%) In a 2-person research team, you will complete a term research project relating to the way in which individuals and/or societies have advanced their understanding of the universe, developed their faith, exercised responsible stewardship and/or utilized their scientific and/or theological understandings to develop ways to enhance the common good. Each research team will prepare, and submit electronically, a summary research paper of 1300 to 1500 words, and then present a 10 to 15 minute oral and/or multimedia class presentation, with a summary outline for each member of the class, of the most significant discoveries, and the new understandings that they were able to make personally through the process of carrying out this term research project.
- (40%) Successfully complete the Mid-Term Exam (20%) and the Final Exam (20%).

THE FINAL COURSE GRADE:

Each student's grade will be based on the grades earned on each of the course requirements above, weighted by the percentages indicated for each portion of the course requirements.

Academic honesty and personal integrity are expected in all aspects of the course. Students should review Sacred Heart University's Policy on Academic Integrity in the Undergraduate and Graduate Catalog (available on-line).

TEXTBOOKS AND OTHER SOURCE MATERIAL:

Required Texts:

- Francis S. Collins, **The Language of God: A Scientist Presents Evidence for Belief**, New York: Free Press, 2006.
John Polkinghorne, **Quantum Physics and Theology: An Unexpected Kinship**, New Haven: Yale University Press, 2007.
Ian G. Barbour, **When Science Meets Religion**, New York: HarperCollins Publishers, Inc., 2000.
Hugh Ross, **Why the Universe is the Way It Is**, Grand Rapids, MI: Baker Books, 2008.
Krista Tippitt, **Einstein's God: Conversations About Science and the Human Spirit**, The Penguin Group, 2010.

Source Material:

- Joel W. Block, **The Old Testament and The Earth Sciences**, Fairfield, CT: Sacred Heart University, 1986.
I. Bernard Cohen, **The Birth of a New Physics** (Revised and Updated), New York: W. W. Norton & Company, Inc. 1985.
Dinesh D'Souza, **What's So Great About Christianity?**, Washington, D.C.: Regency Publishing, Inc., 2007.
George Gamow, **Thirty Years That Shook Physics: The Story of Quantum Theory**, (ISBN: 0-486-24895 - X) 1985.
Owen Gingerich, **God's Universe**, Cambridge, Massachusetts: Belknap/Harvard University Press, 2006.
Stephen Hawking & Leonard Mlodinow, **The Grand Design**, New York: Bantam Books, 2010.
Timothy Keller, **The Reason for God: Belief in an Age of Skepticism**, New York: Dutton/Penguin Group Inc., 2008.
C. S. Lewis, **Mere Christianity**, New York: HarperCollins Publishers, Inc. 2001.
Philip and Phyllis Morrison, **Powers of Ten (Revised)**, New York: Scientific American Library, 1994.
John Polkinghorne, **Exploring Reality: The Intertwining of Science & Religion**, New Haven: Yale University Press, 2005.
John Polkinghorne, **Science & Theology: An Introduction**, Minneapolis, Minnesota: SPCK/Fortress Press, 1998.
John Polkinghorne, **The Faith of a Physicist: Reflections of a Bottom-Up Thinker**, Minneapolis, Minnesota: SPCK/Fortress Press, 1996.
Fazale Rana and Hugh Ross, **Who Was Adam?**, Colorado Springs, CO: Navpress, 2005.
Hugh Ross, **More than a Theory**, Grand Rapids, MI: Baker Books, 2009.
Dava Sobel, **Galileo's Daughter**, New York: Penguin Books (ISBN: 0 14 02.8055 3), 1999.
H. G. Wells, "The Star" (a short story) found in a number of collections, and on-line at:
<http://www.readprint.com/work-1496/H-G--Wells#logo>
Dallas Willard, Ed., **A Place for Truth: Leading Thinkers Explore Life's Hardest Questions**,
Downers Grove, IL: InterVarsity Press/Veritas Forum, 2010.
Ray A. Williamson & Claire R. Ferrer, Eds. **Earth & Sky: Visions of the Cosmos in Native American Folklore**,
Albuquerque, NM, University of New Mexico Press, 1992.

Current Periodical Science Literature:

New York Times: especially the Tuesday Edition's "Science Times" Section – Daily/weekly

Science News issued every 2 weeks

Discover issued monthly

Scientific American issued monthly

Astronomy issued monthly

Sky and Telescope issued monthly & **Various on-line science news sources**

Video Sources (DVDs)

The Films of Charles & Ray Eames: Volume 1: "Powers of Ten", Pyramid Media (1989)

"Journey toward Creation", Pasadena, CA: Reasons to Believe (2003)

"Dual Revelation", Pasadena, CA: Reasons to Believe (2008)

"Steven Hawking's Universe", PBS Production (2004)

"Creation of the Universe", Texas Instruments/PBS Production (1986)

"Cosmic Collisions", NASA & American Museum of Natural History (2006)

"Legacy of the Mound Builders", Camera One (2006)

Earthworks – Visual Explorations of: "Ancient Newark Ohio" (2005) and "Ancient Ohio Valley" (2007)
University of Cincinnati, CERHAS

TEXTBOOKS AND OTHER SOURCE MATERIAL (continued):

Internet/Web Sources

“THE VERITAS FORUM” – University lecture series on faith and current issues. <http://www.veritas.org/media/>

Frances Collins speaking at MIT 2007: “*The Language of God: A Believer Looks at the Human Genome*”
<http://www.veritas.org/media/talks/495>

Owen Gingerich speaking at UC Santa Cruz 2007: “*Is It God's Universe?*” <http://www.veritas.org/media/talks/514>

Allister McGrath & David Helfand speaking at Columbia 2006: “*The God Delusion? Richard Dawkins, Daniel Dennett, and the Meaning of Life*” <http://www.veritas.org/media/talks/496>

Alister McGrath speaking at the University of Cambridge 2008: “*Gospel As Public Truth*”
<http://www.veritas.org/media/streaming/636>

John Polkinghorne speaking at the University of Cambridge 2008: “*Science in the Public Sphere*”
<http://www.veritas.org/media/streaming/634>

Hugh Ross speaking at the University of Florida 1995: “*A Scientist Who Looked and Was Found*”
<http://www.veritas.org/Campus/Recordings.aspx?cid=15#e289>

Rosalind Picard at Georgia Institute of Technology 11 February 2010: “*I...Robot? What makes us human?*”
<http://www.veritas.org/Media.aspx#v/884>

Ard Louis at Stanford University 26 January 2010: “*Can Science Explain Everything?*”
<http://www.veritas.org/Media.aspx#v/904>

Os Guinness at University of California, Los Angeles 7 April 2010: “*The Journey: A Thinking Person's Quest for Meaning*” <http://www.veritas.org/Media.aspx#v/910>

NASA's Astronomy Picture of the Day (Michigan Technical University) <http://antwrp.gsfc.nasa.gov/apod/>

“Reasons to Believe” Website (Hugh Ross, et al.) <http://www.reasons.org/>

Powers of Ten – Scales of the Universe: Internet Sources

“Powers of Ten” Website - <http://www.powersof10.com/>

“COSMIC VIEW: The Universe in 40 Jumps” By Kees Boeke –
<http://www.vendian.org/mncharity/cosmicview/pages/page26.html>

“Secret Worlds: The Universe Within” - <http://micro.magnet.fsu.edu/primer/java/scienceopticsu/powersof10/>

“A Question of Scale” - <http://www.wordwizz.com/pwrsof10.htm>

“The Standard Model” - <http://www.wordwizz.com/frames/topframeset.htm>

The Cosmic Calendar – Scales of the Universe in Time

“The Cosmic Calendar” adapted from Carl Sagan's book Dragons of Eden and his “Cosmos” series on PBS
<http://visav.phys.uvic.ca/~babul/AstroCourses/P303/BB-slide.htm>

Father George Coyne on “The Age of the Universe” (cf. Cosmic Calendar) on YouTube:
<http://www.youtube.com/watch?v=OwWqrXGtrRs>

Descriptive Cosmology Course from the University of Victoria - Professor Babul's Cosmology course PHYS 303 :
<http://visav.phys.uvic.ca/~babul/AstroCourses/P303/Module1.htm>

Earthworks – Visual Explorations of: “Ancient Newark Ohio” and “Ancient Ohio Valley”
University of Cincinnati, CERHAS <http://www.earthworks.uc.edu/>

OUTLINE OF COURSE CONTENT, ASSIGNMENTS* & TENTATIVE SCHEDULE:

I. What are the dimension of physics and the dimension of faith, and how do they relate to our knowledge of the universe? (January 19, 24, 26, 31)

- A. Wednesday, January 19: Epistemology - How do we know what we know? What is faith, and what is science?
- B. Monday, January 24: Where are you (u)? What is the large-scale size and structure of the universe (U)?
What does the size and scale of the U have to do with our sense of human significance?
What does the size and scale of the U have to do with our characterization of God?
- C. Wednesday, January 26: How has our understanding of size and scale in the universe changed over time?
Modeling the Earth
Modeling the Earth-Moon System.
Modeling the Solar System.
- D. Monday, January 31: What is the scale of the universe in time?
How has our view of this time-scale changed over time?
What is the universe like on the small scales of space and time?

II. How does our knowledge of the physical universe, in the context of our faith, relate to our humanity? (February 02, 07, 09, 14)

- E. Wednesday, February 02: What does it mean to be “human”?
- F. Monday, February 07: How do we, on the human-scale, fit into the universe of space and time?
- G. Wednesday, February 09: How does faith inform our understanding of our humanity and our place in the U?
- H. Monday, February 14: Where does the human journey begin on the:
space dimension?
temporal dimension?
spiritual dimension?

III. How does our awareness of and knowledge of the physical and spiritual universe enable the realization of meaning and purpose in our lives? (February 16, 21, 23, 28)

- I. Wednesday, February 16: What is reality?
- J. Monday, February 21: Why are we here?
- K. Wednesday, February 23: What is truth? (VERITAS?)
- L. Monday. February 28: How does the human “desire to know” relate to our search for knowledge, our spiritual quest, and our understanding of the universe?

MX. ← MID-TERM EXAM → Wednesday, March 2nd, 2011

(*NOTE: Specific, detailed assignments will be made on a class-by-class basis, and issued on a 2-class “Set” of assignments for the two lettered “Days” of the course.)

OUTLINE OF COURSE CONTENT, ASSIGNMENTS* & TENTATIVE SCHEDULE: (continued)

IV. How does our knowledge of the principles of physics enable us to appreciate the natural world?

(March 14, 16, 21, 23, 28, 30, April 04, 06, 11)

- N. Monday, March 14: Scientific models and reality. Early conceptions of motions of objects on Earth, motions of the Earth itself, and of motions of objects in the heavens.
- O. Wednesday, March 16: The “mechanical universe” of physics: Copernican, Galilean, and Newtonian Models.
- P. Monday, March 21: Fundamental forces (“interactions”) in the universe, and the nature of matter/energy.
- Q. Wednesday, March 23: The behavior of particles and the behavior of waves – sound, Earthquakes, light?.
- R. Monday, March 28: The nature of light – wave/particle duality, and the “misbehavior” of particles – quantum mechanics.
- S. Wednesday, March 30: Atomic and nuclear physics, quantum mechanics and theology.
- T. Monday, April 04: The origin and nature of the universe. The origin of the Solar System.
- U. Wednesday, April 06: Why does the universe function on the basis of fundamental mathematical laws?
- V. Monday, April 11: Is the universe a product of chance or a matter of purpose? Can we know?

V. How does our knowledge of and application of the principles of physics in the context of our faith, enable us to improve our society for the common good? (April 13, 18, 27, May 02)

- W. Wednesday, April 13: How do science, faith and our place in the world relate?
What about the case of Galileo?
- X. Monday, April 18: How can we use scientific knowledge and technology for the “improvement” of society?
What about the case of nuclear energy? ... nuclear weapons? What guides our decision making?

Happy Easter!!

- Y. Wednesday, April 27: What role does faith have in dealing with our personal future & the future of society?
The cases of natural and man-made disasters: How are we best able to cope with reality?
(H. G. Well’s short story “The Star”)
- Z. Monday, May 02: What is our source of hope? Will science and technology save us from disaster?
How should we define wise stewardship?
Are you simply a product of blind chance or a person of purpose?

FX ← FINAL EXAM → Wednesday, May 4th, 2011 from 8:30 AM (8:00 AM for those needing extra time.)

(*NOTE: Specific, detailed assignments will be made on a class by class basis and issued on a 2-class assignment sheet basis at the beginning of each lettered segment of the course.)

ENJOY THE LATE SPRING & SUMMER!!!!!!!!!!!!!!!
WATCH FOR THE PERSEID METEOR SHOWER VISIBLE AFTER MIDNIGHT AUGUST 12TH!!