PHIL-2031: PHILOSOPHY OF SCIENCE

Cuyahoga Community College

Viewing: PHIL-2031 : Philosophy of Science

Board of Trustees:
March 2019

Academic Term:
Fall 2021

Subject Code
PHIL - Philosophy

Course Number:
2031

Title:
Philosophy of Science

Catalog Description:
Study of concept formation in science and examination of patterns of scientific investigation and method. Treatment of concepts such as observation, classification, causality, law of nature, explanation, and theory.

Credit Hour(s):
3

Lecture Hour(s):
3

Requisites

Prerequisite and Corequisite
ENG-1010 College Composition I, or ENG-101H Honors College Composition I.

Outcomes

Course Outcome(s):
Analyze and explain philosophy of science concepts and their relationship to scientific inquiry.

Essential Learning Outcome Mapping:
Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):
1. Evaluate the objectivity of observation claims.
2. Describe and appraise the logic of scientific classification.
3. Define and assess the concept of law of nature.
4. Critically analyze types of scientific explanation and criteria for their evaluation.

Course Outcome(s):
Apply philosophical conceptions and theory to a philosophical issue in science and successfully argue for a position taken on it.

Essential Learning Outcome Mapping:
Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.
Information Literacy: Acquire, evaluate, and use information from credible sources in order to meet information needs for a specific research purpose.
Written Communication: Demonstrate effective written communication for an intended audience that follows genre/disciplinary conventions that reflect clarity, organization, and editing skills.

Objective(s):

1. Describe and appraise the logic of scientific classification.
2. Interpret and analyze theories of causality.
3. Critically analyze types of scientific explanation and criteria for their evaluation.
4. Interpret and assess historical and contemporary scholarly articles written in the field of philosophy of science.

Course Outcome(s):

Comparatively evaluate the scholarship produced in the field of philosophy of science.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.
Information Literacy: Acquire, evaluate, and use information from credible sources in order to meet information needs for a specific research purpose.
Written Communication: Demonstrate effective written communication for an intended audience that follows genre/disciplinary conventions that reflect clarity, organization, and editing skills.

Objective(s):

1. Interpret and analyze theories of causality.
2. Define and assess the concept of law of nature.
3. Critically analyze types of scientific explanation and criteria for their evaluation.
4. Critically assess types of scientific theory and criteria for their evaluation.
5. Interpret and assess historical and contemporary scholarly articles written in the field of philosophy of science.

Methods of Evaluation:

1. Essay exams
2. Essay assignments
3. Research papers
4. Objective exams
5. Quizzes
6. Class participation

Course Content Outline:

1. Philosophy, science, and philosophy of science
   a. Historical precedents: the emergence of science from philosophy
   b. Branches of philosophy and divisions of science
      i. Philosophy of physical science
      ii. Philosophy of social science
      iii. Logical positivism
   c. Scientific method
      i. One method or a plurality of methods?
      ii. Competing accounts of the logic of method: deductive or inductive?
2. Observation and facts
   a. Naive realism and its weaknesses
   b. Critical realism and its standards
   c. Norwood R. Hanson's account of observation
3. Classification
   a. Purposes for classification
   b. Qualitative and quantitative taxonomies
   c. Aristotle's logic and criteria for classes
   d. Are there natural kinds?
   e. Relation to explanation and prediction
4. Explanation and prediction
   a. Explanations that don't predict, and predictions that don't explain
   b. Senses of "explain"
   c. Explanation using causal laws
      i. Hume's view of causation
      ii. Mill's views on causation
      iii. Causal laws in explanation and prediction

   d. Categorical and statistical explanations
      i. Carl Hempel's deductive nomological model
      ii. Philip Kitcher's Unification model
      iii. Role of the history of science
   e. Standards for explanations
5. Scientific theory
   a. Senses of the term "theory"
   b. Contrast between experimental laws and theoretical laws
   c. Standards for evaluating theories: Quine-Duhem's underdetermination thesis
      i. Social constructivism
      ii. Thomas Kuhn: structure of scientific revolution
      iii. Criticisms of social constructivism
      iv. Feminist issues
6. Science and non-science
   a. Karl Popper on falsification
   b. Science and truth
   c. Application of criteria for observations, explanation, and theory to examples of non-science, e.g., astrology, superstition

Resources

Ackermann, Robert. *The Philosophy of Science: An Introduction*. Pegasus, 1970.

Aune, Bruce. *Rationalism, Empiricism, and Pragmatism: An Introduction*. Random House, 1970.

Campbell, Norman. *What is Science?*. Reprint. Forgotten Books, 2017.

Carey, Stephen S. *A Beginner's Guide to Scientific Method*. 4th. Thompson/Wadsworth, 2012.

Einstein, Albert, and Leopold Infeld. *The Evolution of Physics.* Simon Schuster, 1966.

Feyerabend, Paul. *Against Method*. 4th ed. London, New York, Verso, 2010.

Feynman, Richard. *The Character of Physical Law*. Reprint Edition. Cambridge: The MIT Press, 2017.

Giere, Ronald N. *Understanding Scientific Reasoning*. 5th ed. Fort Worth: Holt, Rinehart, and Winston, 2006.

Hacking, Ian, ed. *Scientific Revolutions*. Oxford University Press, 1981.

Hanson, Norwood R. *Patterns of Discovery: An Inquiry into the Conceptual Foundations of Science*. New Edition. Cambridge University Press, 2000.

Hempel, Carl G. *Aspects of Scientific Explanation: And Other Essays in the Philosophy of Science*. New York, Free Press, 1970.

Hempel, Carl G. *Philosophy of Natural Science.* Prentice-Hall, 1966.

Kuhn, Thomas S. *The Copernican Revolution: Planetary Astronomy in the Development of Western Thought*. REvised Edition. Cambridge: Harvard University Press, 1992.

Nagel, Ernest. *The Structure of Science: Problems in the Logic of Scientific Explanation*. 2nd. Hackett, 1979.

Popper, Karl R. *The Logic of Scientific Discovery*. New York: Routledge Classics, 2002.

Reichenbach, Hans. *The Rise of Scientific Philosophy*. Oakland: University of California Press, 1961.

Ryan, Alan, ed. *The Philosophy of Social Explanation.* Oxford University Press, 1973.

Salmon, Wesley C. *Statistical Explanation and Statistical Relevance.* University of Pittsburgh Press, 1971.

Smith, John Maynard. *The Theory of Evolution*. 3rd ed. Cambridge: Cambridge University Press, 1993.

Trigg, Roger. *Understanding Social Science: A Philosophical Introduction to the Social Sciences*. 2nd. Blackwell Publishers, 2001.

Schroedinger, Erwin. *What is Life?*. Reprint Edition. Cambridge: Cambridge University Press, 2012.

Mason, Marion (Ed.). *Taking Sides: Clashing Views on Controversial Issues in Cognitive Science*. McGraw Hill, 2005.

Schick, Jr., Theodore . *Readings in the Philosophy of Science: From Positivism to Postmodernism*. Mayfield, 2000.

Pearl, Judea. *Causality: Models, Reasoning, and Inference*. 2nd ed. Cambridge: Cambridge University Press, 2009.

Okasha, Samir. *Philosophy of Science: A Very Short Introduction*. 2nd ed. Oxford University Press, 2016.

Kuhn, Thomas S. *The Structure of Scientific Revolutions*. 50th Anniversary ed. Chicago: University of Chicago Press, 2012.

Peter Winch. *The Idea of a Social Science and Its Relation to Philosophy*. New York: Routledge Publishing, 2007.

Shapere, Dudley. *Philosophical Problems of Natural Science.* First. MacMillan, 1965.

Lakatos, Imre and Musgrave, Alan (Eds.). *Criticism and the Growth of Knowledge*. Repr. with corre. Cambridge [Eng.] ; New York : Cambridge University Press, 1980.

Suppe, Frederick. *The Structure of Scientific Theories.* 2nd. University of Illinois Press, 1977.

Duhem, Pierre. *The Aim and Structure of Physical Theory.* Princeton University Press, 1991.

Harding, Sandra. *Can Theories be Refuted?:Essays on the Duhem-Quine Thesis*. 2nd. D. Reidel Publishing Company, 2013.

Lipton, Peter. *Inference to the Best Explanation.* 2nd. Routledge, 2004.

Fraassen, Bas Van. *The Scientific Image.* Oxford University press, 1980.

Dupre, John. *The Disorder of Things*. Harvard University Press, 1995.

Salmon, Wesley, C. *Four Decades of Scientific Explanation.* University of Pittsburgh Press, 2006.

Harding, Sandra. *The Science Question in Feminism.* 4th. Cornell Univeristy Press, 1986.

"The British Journal for the Philosophy of Science"

"Foundations of Science"

"International Studies in the Philosophy of Science: I.S.P.S."

"Metascience"

"Perspectives on Science: Historical, Philosophical, Social"

"Philosophy of Science"

"Philosophy of Science"

Resources Other

1. Philosophy of Science: *http://www.indiana.edu/~philsci/*
2. Philosophy of Science: *http://www.friesian.com/science.htm*
3. Philosophy of Science: *http://dirs.org/dir-wiki.cfm/philosophy_of_science*
4. Philosophy of Science Resources:
5. *http://pegasus.cc.ucf.edu/~janzb/science/*
6. What is Science:
7. *http://hem.passagen.se/thebee/SCIENCE/Science.htm*
8. The Nature and Philosophy of Science:
9. *http://www.angelfire.com/mn2/tisthammerw/science.html*
10. The Internet Encyclopedia of Philosophy:
11. *http://www.utm.edu/research/iep/*
12. The Stanford Encyclopedia of Philosophy: *http://plato.stanford.edu*
13. The Philosophy of Science Association:
14. *http://philosophy.wisc.edu/PSA/Default.htm*

Instructional Services

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