Lingnan University
Department of Philosophy

Course Title	:	Causation, Explanation and Causal Inference
Course Code	:	PHI3001
Recommended Study Year	:	2nd, 3rd and 4th Years
No. of Credits/Term	:	3
Mode of Tuition	:	Lecture and tutorial
Class Contact Hours	:	2 hours lecture/week; 1 hour tutorial/week
Category in Major Programme	:	Programme Elective - Philosophy of Natural and Human Sciences Profile
Prerequisite(s)	:	N/A
Co-requisite(s)	:	N/A
Exclusion(s)	:	N/A
Exemption Requirement(s)	:	N/A

Brief Course Description

Causal and explanatory claims are pervasive in scientific and ordinary discourse: heating an iron bar causes it to expand; smoking causes heart disease; carbon dioxide emission causes global warming; Barry's contraction of syphilis explains his paresis; Newton's laws of motion and universal gravitation explain Kepler's laws, etc. To assess whether these claims are true, we need to figure out what they mean, and what kind of evidence would support or undermine them. In this course, we study and examine various proposals in the philosophy of science literature for analyzing causation and explanation, and explore some methodological issues in causal inference.

The course consists of two parts. The first part will survey the major philosophical approaches to causation and explanation, starting with the regularity account of causation and the closely related deductive-nomological model of explanation, and ending with the recent structural account of causation and the interventionist account of explanation. The second part will examine some methodological issues related to causal inference, drawing on not only ideas developed in philosophy, but also those in statistics and machine learning.

Aims

The course aims to

1. teach students the main theories of causation and explanation in the philosophical literature.
2. familiarize students with stock counterexamples to various theories and stimulate their own criticisms.
3. increase students' appreciation of the difficulty of causal inference and alert them of fallacies in causal reasoning.
4. expose students to some basic ideas in the technical work on statistical causal modeling.

Learning Outcomes

Upon completion of the course, students are expected to

1. grasp the main philosophical theories of causation and explanation, including standard arguments for and against them;
2. be able to explain the central issues in the epistemology of causation;
3. understand the basic ideas in statistical causal modeling.
4. be able to write concise but clear critical reviews.

Indicative Content

1. Causation

   a. Regularity approach
   b. Counterfactual approach
   c. Process approach
   d. Probabilistic approach
   e. Structural approach
2. Explanation
   a. Deductive-nomological model
   b. Unification account
   c. Statistical explanation: inductive-statistical model vs. statistical relevance model
   d. Causal-mechanical account
   e. Interventionist account
3. Causal inference
   a. Mill's canons and controlled experiment
   b. Fisher's idea of randomization
   c. Potential-outcome approach
   d. Causal Bayes net approach
   e. Functional-model approach

Teaching Method

The course will be taught in a lecture/tutorial mode. Tutorials will be devoted to digesting and criticizing the main ideas presented in lectures. Students will be urged to lead discussions in tutorials.

Measurement of Learning Outcomes

Students' progress towards the learning outcomes will be measured by
1. participation in class discussions (LO1 and LO2);
2. short critical reviews (LO1 and LO4);
3. quizzes (LO1, LO2 and LO3);
4. final exam (LO1, LO2 and LO3).

Assessment

15% Class participation
15% Three in-class quizzes
30% Three critical reviews
40% Final exam

Required Readings

A reader consisting of journal articles and selected chapters from the following books:

Beebee, C. Hitchcock and P. Menzies (eds.), *The Oxford Handbook of Causation*, New York: Oxford University Press, 2009.
K. Hoover, *Causality in Macroeconomics*, Cambridge: Cambridge University Press, 2001.
J. Pearl, *Causality*: *Models, Reasoning, and Inference* (2nd ed.), Cambridge: Cambridge University Press, 2009.
S. Psillos, *Causation and Explanation*, Acumen & McGill-Queens U.P., 2002.
W. Salmon, *Four Decades of Scientific Explanation*, Minneapolis: University of Minnesota Press, 1989.
E. Sosa and M. Tooley (eds.), *Causation*, Oxford: Oxford University Press, 1993.

Supplementary Readings

A. Gopnik and L. Schulz, *Causal Learning*: *Psychology, Philosophy and Computation*, Oxford University Press, USA, 2007.

D. Hausman, *Causal Asymmetries*, Cambridge: Cambridge University Press, 1998.
W. Salmon, *Scientific Explanation and the Causal Structure of the World*, Princeton University Press, 1984.
P. Spirtes, C. Glymour, and R. Scheines, *Causation, Prediction and Search* (2nd ed.), MIT press, 2000.
M. Strevens, *Depth: An Account of Scientific Explanation*, Harvard University Press, 2009.
J. Woodward, *Making Things Happen: A Theory of Causal Explanation*, Oxford and New York: Oxford University Press, 2003.

Important Notes

(1) Students are expected to spend a total of 9 hours (i.e. 3 hours of class contact and 6 hours of personal study) per week to achieve the course learning outcomes.
(2) Students shall be aware of the University regulations about dishonest practice in course work, tests and examinations, and the possible consequences as stipulated in the Regulations Governing University Examinations. In particular, plagiarism, being a kind of dishonest practice, is "the presentation of another person's work without proper acknowledgement of the source, including exact phrases, or summarised ideas, or even footnotes/citations, whether protected by copyright or not, as the student's own work". Students are required to strictly follow university regulations governing academic integrity and honesty.
(3) Students are required to submit writing assignment(s) using Turnitin.
(4) To enhance students' understanding of plagiarism, a mini-course "Online Tutorial on Plagiarism Awareness" is available on https://pla.ln.edu.hk/