

Lingnan University
Department of Philosophy

Course Title	: Philosophy of Probability
Course Code	: PHI4399T
Recommended Study Year	: 2 – 4 Years
No. of Credits/Term	: 3
Mode of Tuition	: Lecture & Tutorial
Class Contact Hours	: 3
Category in Major Programme	: Programme Elective – Special Topics
Discipline	: -
Prerequisite(s)	: Nil
Co-requisite(s)	: Nil
Exclusion(s)	: Nil
Exemption Requirement(s)	: Nil

Brief Course Description (*60-120 words in English*)

When a doctor tells you there's a one percent chance that an operation will result in your death, or a weather forecaster tells you there's a fifty percent probability of rain in Hong Kong tomorrow, what does that mean? In this course, we will tackle this question.

We will cover all the major interpretations of probability, with reference to real-world situations and applications. We will also explore how understanding these interpretations can help one to avoid several common errors in reasoning to which we are psychologically predisposed, such as the gambler's fallacy, the inverse fallacy, and the base rate fallacy.

Aims

This course aims to provide students with an understanding of all the key interpretations of probability, and guide them concerning how these interpretations can be applied (in areas such as game theory and genetics). It also aims to provide students with a means to improve their reasoning involving probabilities as a result.

Learning Outcomes

On completing this course, students will be able to:

- (1) Outline and critically assess the relative strengths and weaknesses of the following interpretations of probability: classical, logical, subjective, Objective Bayesian, group, frequency, and propensity.
- (2) Apply the aforementioned interpretations of probability in order to show how theories involving probabilities – such as quantum theory and genetics – may be understood in several different ways.
- (3) Employ the aforementioned interpretations of probability in order to explain how several key fallacies in probabilistic reasoning occur.

Indicative Content

This course will follow Prof. Rowbottom's textbook, *Probability*, which was written to support student learning at Lingnan (on courses such as this one and 'Probability and Scientific Method').

This is structured as follows:

Chapter One: *Probability: A Two-Faced Guide to Life?* – This covers the division between world-based and information-based interpretations, monism and pluralism about probability, and Laplace’s Demon. It also provides an initial taxonomy of the interpretations of probability discussed in the remainder.

Chapter Two: *The Classical Interpretation* – This provides an introduction to how probability theory arose, and to the thoughts of some of the founders of the theory on how it should be interpreted.

Chapter Three: *The Logical Interpretation* – This begins by covering the nature of logical probabilities, in both conditional and unconditional varieties, and discusses how these relate to beliefs. It then discusses how logical probabilities might be measured (e.g., by the use of the principle of indifference), and the key problems with the interpretation (such as the paradoxical nature of the principle of indifference).

Chapter Four: *The Subjective Interpretation* – This chapter starts by explaining how a consideration of gambling behavior and Dutch Books arguably supports a subjective interpretation of probability (via a ‘Dutch Book argument’). It then covers problems with the Dutch Book argument, and discusses how degrees of belief might be construed and potentially measured. In the penultimate part, it considers other objections to the subjective view of probability. In closing, it considers the prospects for monism about subjective probabilities (and the apparent assumption of independence this involves).

Chapter Five: *The Objective Bayesian Interpretation* – This begins by explaining how the subjective interpretation might be ‘topped up’ by introducing extra constraints for rational degrees of belief, most notably calibration and equivocation. It continues by discussing objections to Objective Bayesianism, and to what extent Objective Bayesianism is distinct from the logical interpretation. It closes by explaining how there is a spectrum of possible interpretations running from the subjective to the Objective Bayesian.

Chapter Six: *Group Level Interpretations* – This explains how considering group Dutch Books and group rationality leads to the conclusion that there might be group-level probabilities. It then presents two different versions of the group level view, and compares their relative merits.

Chapter Seven: *The Frequency Interpretation* – This covers a variety of different variants of the view that probabilities are relative frequencies, with reference to finite empirical collectives, infinite empirical collectives, and hypothetical collectives. It presents objections to each of these variants in turn. It pays special attention to the version of the frequency interpretation preferred by Von Mises.

Chapter Eight: *The Propensity Interpretation* – This chapter introduces the idea that probabilities might be connected to dispositions, and be present in single cases. It also presents the long run propensity view championed by Gillies. It closes by discussing several problems for the propensity view, including the reference class problem and Humphrey’s paradox.

Chapter Nine – *Fallacies, Puzzles, and a Paradox* – This chapter explains the following – and how each may be avoided or resolved – with reference to the interpretations presented in the earlier chapters: the gambler’s fallacy, the base rate fallacy, the inverse fallacy, the conjunction fallacy, and the Monty Hall paradox.

Chapter Ten – *Probability in the Humanities, Natural Sciences, and Social Sciences* – This shows

how the interpretations of probability discussed earlier can be employed in confirmation theory, Mendelian genetics, game theory, and quantum theory.

Teaching Method

The course will be taught via lectures supported by tutorials.

Measurement of Learning Outcomes

Students will produce two assessed essays, one at the mid-term, and one at the end (as a final take-home examination).

Students will also answer ten short quizzes on the material in each chapter outlined above (in tutorials).

All learning outcomes will be measured by each assessment component (although not each individual essay or test).

Assessment

40% - Mid-term essay

40% - Final essay

20% - Tutorial quizzes

The standard departmental rubrics will be used for essay assessment.

Required Readings

Rowbottom, Darrell P. 2015. *Probability*. Polity Press.

Supplementary Readings

Many such recommended readings are provided in the textbook above, at the end of each chapter.

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/>