Syllabus

The Part IA logic course is in two parts, one on formal logic and one on philosophical logic.

Section A: Formal Logic
- Basic concepts: formalized languages; object-language and metalanguage; use and mention; validity, implication and consistency.
- Truth-functional logic: truth-functions, tautologies, proof.
- Introduction to first-order logic: the language of quantifiers and variables; validity and counterexamples; elements of the logic of identity.
- Classes and relations.
- Elements of probability calculus.

Section B: Philosophical Logic
- Problems of translation between natural and formal languages.
- Names, variables and descriptions; referential and substitutional readings of the quantifiers.
- Necessity, analyticity and the a priori.
- Meaning, intention and conventions.

Course Outline

This compulsory course aims to introduce students to some basic issues in the philosophy of logic and language and to the idea of a formal logic. There is a complex interplay between these informal and formal elements of the course. The key notion is the idea of a valid argument (e.g. All men are mortal; Socrates is a man; so, Socrates is mortal). Arguments can be constructed in English and in the various formal languages which the logician invents, and formalised arguments are supposed to tell us something about the corresponding English arguments. Hence we need to know what validity is and why it is significant: are all good arguments valid? Are all valid arguments good? Validity of English arguments is an imprecise and intuitive notion, but validity of arguments framed in a formal language can be made precise.

Students will be introduced to two simple formal languages, those of truth-functional and first-order logic. Students will be introduced to the idea of formal derivations using natural deduction. They will also study the elements of probability theory, a part of mathematics that creates almost as many philosophical problems as it solves.

The notion of meaning is central to the philosophy of logic and to the philosophy of language in general. The course covers the relationships between meaning and intention. Is there a stable distinction to be drawn between analytic truths, which are true solely in virtue of their meaning (e.g. All bachelors are unmarried) and synthetic truths, which require the world to be a certain way (e.g. Most people die before the age of 80)? How is this related to two others, that between necessary and contingent truths and that between a priori and a posteriori truths?

Objectives

Students will be expected to:
1. Acquire a broad understanding of the scope and purpose of logic.
2. Learn how to symbolize natural language arguments using formal languages, and how to test the resulting formalizations for correctness.
3. Begin studying philosophical issues in logic.
4. Develop their powers of philosophical analysis and argument through study of what constitutes a valid argument.

Prerequisites

None

Preliminary Reading

For the idea of formal logic:


For some philosophical reflection on logic-related matters, dip into the opening chapters of:


For a brisk overview of some issues both formal and philosophical see:

PRIEST, Graham, Logic: A Very Short Introduction (Oxford: Oxford University Press, 2000). Also available online at:
http://doi.org/10.1093/actrade/9780192893208.001.0001.
The way this reading list is structured

Readings typically divide into (A) and (B) lists below: some attempt is made to put material in the basic (A)-lists into a sensible reading order. (B)-lists are for dipping into: no-one expects you to read everything on the (B) list on a topic, but do read something.

The divisions are of course somewhat arbitrary, and different supervisors will want to take different views about what is basic – needed to make a shot at a supervision essay – and what pushes on the debate rather further.

SECTION A: FORMAL LOGIC

BASIC CONCEPTS

(A) Basic reading

The textbook for this part of the course is:


forallx was originally written by P.D. Magnus. Magnus has very generously made the work available under a Creative Commons license. This licenses derivative work, and the text has been altered for the Cambridge course. (Students should feel free to express their gratitude to Magnus, who can be reached at www.fecundity.com/logic/)

Important Warning. Every logic textbook is idiosyncratic in various ways. Quite apart from differences in emphasis, different books may use:

- different nomenclature (e.g. “predicate logic” rather than “first-order logic”);
- different deductive systems (e.g. taking different rules as primitive);
- different notational conventions (e.g. “→” or “⇒” instead of “→” for negation; Appendix A of forallx: Cambridge version summarises the various alternatives).

At the risk of repetition, the official textbook for this part of the course is forallx: Cambridge. This is what you will be taught from, and it is what you will be examined on. If in doubt, ask the lecturer, your supervisor, or your logic class tutor.

(B) Further Reading

With the Important Warning in mind, students may sometimes wish to read beyond the textbook. This article discusses the idea of logical consequence, going into a bit more detail than sections 1-4 of forallx:


The following offer some alternative approaches to paraphrasing between formal and natural languages:


CLASSES AND RELATIONS

(A) Basic reading


The book’s website is at: www.ericsteinhart.com/TOOLS/tools-resources.html. Some further support materials and exercises can be found there.


(B) Further Reading

Everyone could profit from looking at:

SMITH, Peter, An Introduction to Formal Logic (Cambridge: Cambridge University Press, 2009), ch. 32. [Helpful introduction to relations]
Mathematically-inclined might prefer some brisker introduction to core concepts and notation of set theory. Try:


### ELEMENTS OF PROBABILITY CALCULUS

**A) Basic reading**


**B) Further reading**

For alternative introductions to the calculus, two accessible treatments are:


### PHILOSOPHICAL LOGIC

#### PROBLEMS OF TRANSLATION BETWEEN NATURAL AND FORMAL LANGUAGES

Our main focus in part IA is the question about the relationship between the ordinary language propositional connectives and their formal logic counterparts. We are particularly interested in the relationship between the English 'if… then…', and the material conditional $\rightarrow$. (NB some texts use $\supset$ rather than $\rightarrow$)

**A) Basic reading**

For some introductory remarks, see:


PRIEST, Graham, *An Introduction to Non-Classical Logic: From If to Is*. 2nd rev. ed. (Cambridge: Cambridge University Press, 2008), sects. 1.6-1.10. Also available online at: http://doi.org/10.1017/CBO9780511801174.

The absolute must read article is by Grice, in which he introduces the idea of a controversial implicature:


And here are some useful surveys:


**B) Further reading**

Three good discussions are:


Jackson's views are further developed in:


After that you could look at the following, which is wonderfully rich, and worth looking at if only to convince yourself that the issues here are difficult and not-trivial:


Finally, look at this excellent (advanced) discussion of some attacks on Grice's notion of implicature, which helps clarify exactly what his notion should be (it also ties together themes from this topic, and the topic of *Meaning, Intention and Convention*):

One of the deepest ideas that we meet in elementary logic is treatment of quantified expressions (e.g. "everyone loves someone") with quantifiers and variables. For a brisk reminder of the modern treatment, re-read the chapters on First-Order Logic from forallx.

We have Frege (and Peirce) to thank for realising that logic could be approached in this way. For a hint at Frege’s achievements, read:


The landmark explanation of Frege’s achievement is hard to read, but worth it:


One of the most startling deployments of the use of quantifiers and variables is in Russell’s Theory of Descriptions. This is sometimes regarded as the paradigm of analytic philosophy. Russell first presented his Theory of Descriptions in ‘On Denoting’, Mind, 14 (1905): 479-93. But this is a much more accessible explanation:


The following is an excellent analysis of Russell’s arguments:


You should also read the classic debate between Russell and Strawson:


The next stage in the discussion of variables and quantifiers considers how we should understand quantification. This is a difficult topic, and before going in, you need to make sure you really understand the semantics for quantifiers presented in forallx. One of the foremost defenders of substitutional quantification was Ruth Barcan Marcus, and this is a clear introduction to her reasons for favouring it.


After reading this, take a look at two fairly light surveys of the options:


HAACK, Susan, Philosophy of Logics (Cambridge: Cambridge University Press, 1978), ch. 4, sects. 1 & 3. Also available online at: http://doi.org/10.1017/CBO9780511812866.
NECESSITY, ANALYCITY, AND THE A PRIORI

(A) Basic Reading

We need to distinguish three distinctions: necessary / contingent; analytic / synthetic; and a priori / a posteriori. For an introduction to these three distinctions, try:


The classic empiricist view is that necessity, analyticity and a priori come as a single package. For a defense of this view, see:


But there have been two prominent sorts of attack on this view. The first was from Kant, who claimed that there are synthetic a priori truths. See:


The second attack on the empiricist view was Kripke’s claim that there are contingent a priori truths and necessary a posteriori truths. See:


For discussion, try:


You might also want to look at this wide-ranging textbook treatment:


(B) Further Reading


VAN CLEVE, James, *Problems from Kant* (Oxford: Oxford University Press, 1999), ch. 2 'Necessity, analyticity, and the a priori'. Also available online at: [www.dawsonera.com](http://www.dawsonera.com).

MEANING, INTENTION, AND CONVENTIONS

(A) Basic Reading

You must start with the classic:


For a development of Grice's view, which shifts from intention to conventions, see:

BLACKBURN, Simon, *Spreading the Word* (Oxford: Oxford University Press, 1984), ch. 4 'Conventions, intentions, thoughts'. Also available on Moodle.

And for critical discussions, see:


(B) Further Reading

This is a nice article on post-Gricean attempts to offer intention- (and possibly convention) based approaches to semantics:


The pioneer of convention-based approaches, though, was Lewis; it might help to read his presentation alongside Rescorla’s survey:


Finally, take a look at a fun but subtle attack on the importance of conventions: