

# Deductive Logic Syllabus

## Summer 2014

### Course Description

Logic is the study of valid demonstrative argumentation. A valid argument is one whose premises imply its conclusion. Implication is in turn a matter of argumentative structure. One statement implies another if the form of the two statements guarantees that if the first is true, then the second must also be true. Logic thus begins with an abstract analysis of language designed to expose the form of statements. We will undertake this analysis by learning to paraphrase English statements with sentences of a more perspicuous notation. Armed with our analysis, we will proceed to a rigorous definition of implication. We will then develop formal methods for ascertaining the implication of one statement by others, and reflect philosophically upon what we have thereby achieved.

Our course is split into two units. The first unit treats truth-functional logic, those aspects of logical structure that emerge out of reflection on English expressions such as “and,” “not,” “either ...or,” and “if ... then,” which are used to combine statements into compound statements. The second unit extends our results by examining the logical structure revealed by the behavior of such words as “every,” “each,” “all,” “some,” “none,” and “it”—words essential for the expression of generality.

Logic may sound like a dry subject. Indeed, it is a dry subject. After all, “and,” “not,” and “every” are dull words compared with those you examine in other courses, such as “atom,” “matrix,” “biotic,” “vascular,” “virus,” “inflation,” “democracy,” “heteronormative,” “patriarchy,” “justice,” and “god.” But our humble logical words occur in discourse on every subject matter whatsoever. Studying logic reveals a framework to which thought on any subject must conform on pain of incoherence. Our class will uncover the principles that underlie the aggregation of knowledge. Logic’s interest lies in its unique abstractness, and in the combination of that abstractness with mathematical rigor.

This will be a theoretical course, not a practical “how-to-think” course. However, the logical techniques we will study will give you an enhanced grasp of the logical structure of English sentences, and thinking about these techniques will afford an experience of abstract, rigorous thinking. These two benefits will contribute to your ability to critically analyze both your own reasoning and the reasoning of others.

### Course Requirements

#### Problem Sets – 50%

You will be assigned a problem set at the end of each Wednesday class. You must submit a hard copy of your solutions to these problems in class the following Monday. Late submissions will not be graded. Electronic submissions are not allowed. There will be no make-up problem sets. Your lowest problem set score will be dropped in determining this portion of your grade, but all six must be submitted. Missing a problem set will result in an automatic 10% penalty to your final grade. You are encouraged to talk with each other about the problem sets, but the final written work that you turn in must be your own.

### Midterm Exam – 20%

There will be a two-hour midterm exam on Wednesday July 16. Make-up midterm exams will be given only to students who provide an acceptable and documented reason for missing the exam.

### Final Exam – 30%

There will be a cumulative three-hour final exam on Wednesday August 6. In the case of exceptional circumstances that cause a student to miss the final exam, an appeal for a make-up must be submitted through Academic Services. For more information, see <http://www.summer.harvard.edu/exams-grades-policies/exams>.

### Homework – Ungraded

I will occasionally post homework questions, with worked solutions, to our course website. Although your solutions to these problems will not be graded, I strongly recommend that you complete these practice problems in order to keep up with the material.

### How to do well in this class

Come to class prepared. Being prepared means that you have completed the assigned reading, thought carefully about it, and have begun to formulate questions concerning any issues that it raises. Give yourself time to complete the problem sets. If you run into difficulties, turn in what you have managed to finish, and make a note to carefully attend to the worked solutions provided in the next class. It will behoove you to practice with further problems until you are confident that you have understood your earlier mistake. Logic has a steep learning curve. The concepts that we will investigate in this class are initially straightforward, but do not be fooled: if you are not vigilant in keeping up with the assigned material you will quickly fall behind.

### Textbook and Class Reading Schedule

Goldfarb, Warren. *Deductive Logic* (DL). Indianapolis: Hackett Publishing Co., 2003.

1. Monday June 23	Statements; Conjunction and Negation	DL § 1-3
2. Wednesday June 25	Disjunction, Conditional, and Paraphrase	DL § 4-8
3. Monday June 30	Interpretation and Validity	DL § 9-11, 13
4. Wednesday July 2	Use and Mention; General Laws	DL § 12, 14
5. Monday July 7	Truth-functional deductions	(DL supplement §14a)
6. Wednesday July 9	Truth-functional deductions continued	(DL supplement §14b)
7. Monday July 14	DNF and Expressive Adequacy	DL § 15-16
8. Wednesday July 16	Limits of Truth-functional logic	DL §18-20
<b>MID-TERM EXAM</b>		
9. Monday July 21	Monadic Quantification Theory	DL §21-24
10. Wednesday July 23	Polyadic Quantification Theory	DL § 28-29
11. Monday July 28	Interpretation and Validity	DL § 30-31
12. Wednesday July 30	Deduction and Identity	DL §32-34, 41
13. Monday August 4	Names and Descriptions	DL §42-44
14. Wednesday August 6	<b>FINAL EXAM</b>	