

Intermediate Logic I
Winter 2008

T, TH 9:00-10:20

Instructor: Michael Kremer

My office is 224 Stuart Hall. I will hold office hours Wednesdays, 2:00-4:00. If this time is not convenient we can make an appointment for another time. My office phone is 834-9884; my home phone is 643-1223. I can be reached by e-mail at kremer@uchicago.edu.

Course objectives and prerequisites: The main objective of this course is to introduce the basic results of the metatheory of first-order logic. “First-order logic” here refers to the logic of truth-functions (“or,” “and,” “not,” etc.), quantifiers (“all,” “some”) and identity (“=”). The course assumes that you have a basic *practical* mastery of the concepts of first-order logic – that you are familiar with some or other symbolic language and can apply this language in the analysis of natural-language arguments, can carry out proofs of the validity of arguments, and so on. The essentials are covered in typical introductory formal logic courses. There are many introductory logic textbooks covering this material. One which I recommend is *The Logic Book* by Merrie Bergmann *et. al.* We will briefly review some of this material at the beginning of the course.

In this course we will also require some elementary knowledge of set theory. The essential techniques will also be covered at the beginning of the course, using handouts. There is also a very brief discussion of some of this material in Chapter 0 of the textbook.

The material covered in the main part of the course often goes by the name “metatheory” or “metalogic” since it involves the *application* of logical techniques in the development of a *theoretical* understanding of logical concepts. The main results we will discuss in the course are those needed to build up a detailed proof of the completeness and consistency theorems for first-order logic with identity. The text for this part of the course will be Herbert Enderton’s *A Mathematical Introduction to Logic*. We will work through most of the first two chapters of this text systematically. There will not be time to go through all the details of every argument in class, of course; my goal in lecture will be to present the main ideas of the proofs, paying attention to details when these seem particularly instructive. However, you will be responsible for the trees as well as the forest.

Course Website: This course has a chalk website (go to chalk.uchicago.edu). This syllabus, assignments, and possibly other announcements and links of interest, will be posted from time to time on that website. There is also an anonymous discussion board which you can use to talk to one another about the course and also to communicate to me about how the course is going.

Text: The text, Herbert Enderton’s *A Mathematical Introduction to Logic* (second edition), is available for purchase at the Seminary Co-op. This text will be supplemented by handouts which will also be posted on the chalk website.

Work of the Course: There are two requirements for the course, weighted as follows.

(1) **Homework Assignments:** There will be frequent homework assignments over the course of the quarter. These are to be turned in *in class* on the assigned due date. I strongly encourage *collaboration* on the exercises. On the other hand (of course) I strongly discourage handing in someone else's work as your own. Use your judgment! (80%)

(2a) **Final exam:** administered during the regular exam period, and covering the whole course. (20%)

ROUGH Schedule of Readings

1/8-1/15 Introductory material

1/8-1/10 Introduction, review (handout)

1/10-1/15 Review, sets (handout – see also Enderton, 0)

1/17-2/7 Sentential Logic

1/17-1/24 Syntax, Semantics: Enderton, 1.0-1.2

1/24-1/29 Unique Readability and Recursion: Enderton, 1.3-1.4 (we won't stick close to the text here; reading should be inessential)

1/31-2/5 Compactness Theorem, Deduction, Soundness and Completeness: Enderton, 1.7 (treating only pp. 59-60 in detail, but including exercises 5, 6, 7, p. 66, which we will in effect work through)

2/7 Catch up day (if needed)

2/12-3/13 First Order Logic

2/12-2/19 Syntax, Semantics: Enderton, 2.0-2.2 (skipping pp. 90-99, but including the substitution lemma, pp. 133-134)

2/21-2/28 Proof Theory: Enderton, 2.4 (including soundness theorem, pp. 131-134)

3/4-3/6 Completeness Theorem: Enderton, 2.5 (pp. 135-142)

3/11 Compactness and Löwenheim-Skolem Theorems: Enderton, 2.5, 2.6 (pp. 142, 151)

3/13 Further Prospects – handout (class on 3/8 is optional for undergraduate students)

ROUGH Schedule of Assignments

1/22 Assignment 1 (review, sets)

2/5 Assignment 2 (1.1, 1.2)

2/19 Assignment 3 (1.3, 1.4, 1.7)

3/4 Assignment 4 (2.0, 2.1, 2.2)

3/14 Assignment 5 (2.4, 2.5) (this assignment will be turned in in my mailbox in the philosophy department on the Friday of 10th week)

FINAL EXAMINATION

Tuesday 3/18, 8:00-10:00 a.m.