PHIL 310 — “Intermediate Logic”

Winter Term 2015 — 3 credits

Course Outline

Lectures:	MW 1–2:30, 110 Leacock
Instructor:	Richard Zach
Of ce:	935 Leacock
Email:	richard.zach@mcgill.ca Phone: (514) 398–4400 x 26035
Of ce Hours:	M 2:30–3:30 (subject to change) or by appointment

Course Description

Formal logic has many applications both within philosophy and outside (especially in mathematics, computer science, and linguistics). This second course will introduce you to the concepts, results, and methods of formal logic necessary to understand and appreciate these applications as well as the limitations of formal logic. It will be mathematical in that you will be required to master abstract formal concepts and to prove theorems aboutlogic (not just in logic the way you did in Phil 210); but it does not presuppose any advanced knowledge of mathematics.

We will begin by studying some basic formal concepts: sets, relations, and functions and sizes of in nite sets. We will then consider the language, semantics, and proof theory of rst-order logic (FOL), and ways in which we can use rst-order logic to formalize facts and reasoning abouts some domains of interest to philosophers and logicians.

In the second part of the course, we will begin to investigate the meta-theory of rst-order logic. We will concentrate on a few central results: the completeness theorem, which relates the proof theory and semantics of rst-order logic, and the compactness theorem and Löwenheim-Skolem theorems, which concern the existence and size of rst-order interpretations.

In the third part of the course, we will discuss a particular way of making precise what it means for a function to be computable, namely, when it is recursive. This will enable us to prove important results in the metatheory of logic and of formal systems formulated in rst-order logic: G ödel's incompleteness theorem, the Church-Turing undecidability theorem, and Tarski's theorem about the unde nability of truth.

Prerequisites

Introduction to Deductive Logic (Phil 210), Logic and Computability (Comp 230), or equivalents. Not open to students who have taken Math 498.

Readings

Readings will be made available electronically on myCourses. There is no required text-book.

Requirements and Evaluation

Course Requirements. An initial mini-assignment (5%), six problem sets (60%, 10% each) and a nal exam (25%) are required to pass the course. The remaining 10% will be based on participation in discussion in-class and on myCourses.

Evaluation and Grades. On each assignment or exam problem you will receive a letter grade re ecting the level of comprehension of the material displayed.

A Very good—superior performance, showing comprehensive understanding of subject matter.

B Good—clearly above average performance with knowledge of subject matter generally complete.

C Satisfactory—basic understanding of the subject matter.

D Conditional pass—marginal performance.

F Fail—Unsatisfactory performance.

In computing your nal grade, your marks will be converted to grade points and averaged according to the weights given above (A = 4, B = 3, C = 2, D = 1, F = 0). “Slash” grades receive 0.5 below the value of the higher grade (e.g., A/B = 3.5).

Late work and extensions. Assignments are generally due on Wednesdays at the beginning of class. Assignments handed in late will be penalized by the equivalent of one grade point per calendar day, unless you can document a medical or other valid reason for why your assignment is late.

Collaboration. Collaboration on exercises is encouraged. However, you must write up your own solutions, and obviously you must not simply copy someone else's solutions.
Assignments

F

Week 5 (Feb 2, 5). Sequent Calculus and Proofs in FOL.

Problem set #2 due Feb 5

Week 6 (Feb 9, 12). The Completeness Theorem.

Week 7 (Feb 16, 18). Compactness and Löwenheim-Skolem Theorems

Problem set #3 due Feb 18

Week 8 (Mar 23, 25). Recursive Functions

Week 9 (Mar 9, 11). Arithmetization of Syntax

Problem set #4 due March 11

Week 10 (Mar 16, 18). Theories and Computability

Week 11 (Mar 23, 25). Gödel's Incompleteness Theorems

Problem set #5 due April 25

Week 12 (Mar 30, Apr 1). The Undefinability of Truth.

Week 13, 14 (Apr 8, 13). Applications.

Problem set #6 due April 13.

McGill Policies

McGill University values/academic integrity