Phil 210:

Introduction to Deductive Logic

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Office Hours: To Be Announced. See MyCourses for all Office Hours

Lectures: Mondays and Wednesdays: 13:35–14:25. Stewart Biology Building, Room S1/4

Conference: 1 hour weekly—Rooms and Times TBA on Minerva (most often, Thursday or Friday).

Summary of Material. This course examines the main elements of *deductive logic*, the modern form of the discipline which has traditionally studied correct forms of inference and reasoning, one of the oldest and most important branches of philosophy. Modern Deductive Logic (which stems from the late 19th c.) is primarily concerned with correctly deducing a *conclusion* from given premises, thus with what is often called valid inference or argument or logical consequence or (informally) 'following [logically] from'. The key ideas are introduced using a simplified language, here called FOL, which abbreviates 'first-order logic'. (NB: This language is not English, though it can sometimes appear as if it is. It's best to think of it as a new abstract language.) We develop a part of this language first using a special case, where we have some names for objects and then a limited number of what we call predicates, which could be thought of as similar to names for a few distinguished properties of objects, and a few simple relations between objects. We take this as a base, and this base then gives rise to elementary sentences. We then expand this simple language by importing a few ways to connect sentences (starting with the elementary sentences), thus some *connectives*, to form more *complex sentences*; any of these sentences can then be used first to state things, and then to form arguments, which latter can be viewed in effect as certain chains of sentences. This apparatus yields what is often called (classical) *propositional logic*, an important part of logic expressed in a fragment of FOL. Using this fragment, we define some of the central notions of logic such as equivalence, consistency, tautology, and above all valid inference/logical consequence, and we explore the central links between all these.

From here, we proceed to develop a *proof* or *deduction* system for this fragment, i.e., a way of *deriving* step-by-step logical consequences from given sentences as a starting point. (The proof/deduction system in effect is built on a small number of valid inferences, which can then be shown to yield *all* valid inferences.)

In the second part of the course, we consider a more complex version of FOL, now incorporating what are called *quantifiers* and *variables*, which gives a correspondingly more complex means of expression allowing us to deal above all with *generality* (so we can speak of 'all students' or 'all triangles', and form sentences built around phrases like these). Along with this expansion of the means of expression we expand to modified definitions of the key notions, and then a correspondingly more complex system of deduction. (Again, a small number of valid inferences is selected, which yields *all* valid inferences.)

The exposition in the lectures will broadly follow that of the textbook (see below), which means that *the textbook is indispensable*, and regular reading of it is **ESSENTIAL**. Examples are to be

found in abundance in the textbook, and should be worked through as a matter of **routine**, *without being instructed so to do*. The lectures will concentrate more on the *theoretical* side of the material rather than on examples; the exercises supply the examples, and it is above all through working with the examples that you will come to understand the material. Moreover, questions on the exams and assignments will be somewhat similar in form to these. Some of them will be challenging, not just asking you to reiterate what you have learnt, but to use this in ways which at first sight might not be entirely clear. However, the main theoretical aim is to understand *why* the mechanisms presented work, and not simply to be able to apply them. Correspondingly, some of the questions on the tests and assignments will be *theoretical* in nature. (*You should take note of this fact* NOW.)

NB: Extra exercises might be posted via Handouts.

Also please note now that the final exam, worth 50% of the overall mark, will range over material from the whole course.

Conferences: As implied above, formal logic is very much a subject where practice is essential, and where the exercises really instil familiarity with the material. In addition to the lectures, there will be one conference hour per week (probably starting from the second week). The main purpose of these conferences will be to work through selected examples; **attendance at conferences is therefore indispensable**, and proper preparation for the conferences requires prior practice of the relevant exercises. *Note that conference size is limited; please sign-up promptly to get the time you desire*. Very early on, a weekly guide to the course (a Provisional Schedule) will be posted; this is to be regarded (as its title makes clear) as a *preliminary* and *provisional* schedule for the course, and is to be taken as an *informal* guide to the reading and the exercises you ought be doing at a given stage of the course, and to the order in which matters are deal with. To repeat, because this point is often misunderstood, the guide is provisional and not definitive. This applies in particular to the TIMING OF THE ASSIGNMENTS AND THE MID-TERM EXAM. This means in particular that you should not make travel or holiday plans which are predicated on *provisional* timing information in the *provisional* schedule. As an ideal to aim for, you should really aim to be prepared for exams and assignments at any time.

As well as listing exercises to be tackled, the Provisional Schedule gives advice about to approach them.

Conference and Lecture Times: The times set aside for this course are 13.35–14.25 on M, W., and F. Standardly, there will be *no lecture* on Friday, just on Mondays and Wednesdays. Conferences will be offered in 8 different time-slots, the majority (room availability allowing) on Wednesdays, Thursdays, or Fridays. The course time-slot of Friday 13.35–14.25 is the one time when we know you are free, since you are in this course! Hence, we will try our best to offer several conferences in this slot.

A Warning: Many students standardly find the second half of the course much more difficult and complicated than the first. Therefore, finding the initial stages easy is not a sign that you will find the whole course so. In addition, understanding the material is also by its nature cumulative; one cannot neglect the course for a few weeks, and then expect to understand new material without the background of the old. The same applies to the readings/sections/exercises marked out in the schedule: if you're behind on this, you must try to catch up in order, and not skip.

Handouts etc.: Any clarificatory handouts, extra exercises (if any), summaries, lecture slides,

assignments, the Mid-Term Exam will all be distributed via *myCourses*; announcements will also be distributed through the announcement/e-mail functions available there.

Note that this system uses *only* your official McGill e-mail address, so this (as well as *myCourses*) \underline{NB} should be checked regularly and routinely.

Reading Matter. The textbook for the course is:

• Barker-Plummer, Barwise, Etchemendy et al.: *Language*, *Proof and Logic*. *Second Edition*. (CSLI Publications.)

This will be available from The Word Bookstore, 469 Milton Street (250 metres from the University Street Gates). **This text is essential. NB.** *Cheques and cash only; no credit cards.*

Software The book comes with a CD which contains a (very) useful PDF version of the text. The CD also contains 3 software programs on which some of the practice exercises in the book are based, together with a bank of files for use in these programs. The computer-based exercises standardly begin with one of these files, and your solutions to many of the exercises can be checked by submitting them to an on-line marker. (**You can only register for this if you have a** <u>*NB*</u> **Book/CD–ID which is unused;** if you acquire the book second-hand, then it's overwhelmingly likely that the ID has been used before. However, the exercise checker is not essential, and the other components of the software should work.) Read carefully the section *Essential Instructions about Homework Exercises*, pp. 5–10 of the book. (IMPORTANT: If you do use the exercise checker, <u>*NB*</u> please specify only your OWN e-mail address for the 'Submit' function, and not any of ours.)

Another Warning: Our experience over many years has been that the software is very much a two-edged sword, helpful in small doses and for getting the idea of how certain things work, but not something to become reliant on. In the end, you must be able to do exercises on Assignments and Exams independently of software, and therefore know *how* to set them up and do them independently.

Marking and Assessment There will be two assignments, worth 12.5% each; one take-home mid-term test worth 25%; one formal, final exam worth 50%. *Note that it is a rigid requirement that you pass the final exam to be able to pass the course, no matter how well you have done on the assignments etc. prior to the exam.*

The Assignments will be due at approximately (but not *exactly*) the 1/4 and 3/4 points of the semester, and the Mid-Term Exam at approximately the half-way point. *Extensions to deadlines set will be granted only in very exceptional circumstances, usually only for medical reasons and with a medical note, or for other emergencies, appropriately documented. Certainly no allowance can be made for travel, no matter how far ahead it was arranged.* Please keep copies of work submitted. This is essential: with upwards of 300 students in the course and many TAs/instructors, work can easily be mislaid.

Please note two things: (*a*) We will post a Handout on grading policy which you should all read. (*b*) Collaboration on exercises and then on assignments is encouraged; after all, learning from and teaching your peers should be an important part of the scholarly process. But what you cannot do is submit identically or even similarly worded assignments for marking. (See McGill's policy on plagiarism listed below.)

Policy for Late Work Late work will be penalised at the rate of a third of a full letter grade (or about 5%) per day overdue. Thus, an assignment judged to be worth a B+ (or around 77%) but \underline{NB} late one day will be assigned B (or around 72%), late two days B- (67%), and so on.

McGill Policies

1. McGill University values academic integrity. Therefore all students must understand the meaning $\frac{NB}{M}$ and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures. (See www.mcgill.ca/integrity for more information.)

2. In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.

3. In accord with McGill University's Charter of Students' Rights, students in this course have the right, without seeking permission, to submit in English or in French any written work that is to be graded.

4. As instructors of this course, the Lecturer and TAs endeavor to provide an inclusive learning environment. If you experience barriers to learning in this course, do not hesitate to discuss them with us or with Student Affairs or the Office for Students with Disabilities, https://www.mcgill.ca/osd, 514-398-6009.

5. *McGill University is on land which is the traditional and unceded territory of the Kanien'keha:ka (Mohawk), a place which has long served as a site of meeting and exchange amongst nations.*