Logic I — Richard Zach

Phil 279 L03/L07 — Fall 2002

	Instructor	Teaching Assistants	
	Richard Zach	**Sara Bagg**	**Bogdan Rabanca**
Office:	1254 Social Sciences	1211 Social Sciences	1239 Social Sciences
Office Hours:	W 3–4, Th 11–12	W 1:30–3	M 1:30–3
	or by appointment. Note that OH may be changed; check the website for change notices.		
Phone:	220–3170	210–3884	220–6465
email:	rzach@ucalgary.ca	slbagg@ucalgary.ca	brrabanc@ucalgary.ca

Lectures:		Tutorials:	
L03:	TuTh 12:30–2	W 9–10 (Sec 7 & 19)	63 Science Theaters
	3 Engineering A	W 10–11 (Sec 8 & 20)	133 Science Theaters
L07:	TuTh 2–3:30	W 11–12 (Sec 9 & 21)	61 Science Theaters
	142 Administration	and concurrently in	TRI Lab 1 (018 SS)

Course Description

The course will introduce you to the semantics and proof-theory of first-order logic. We will learn how to "speak" the language of FOL, study the method of truth tables, become proficient in giving formal and informal proofs, and learn how to construct and argue about first-order interpretations. These methods will enable us to answer, in particular cases, the questions that logic is primarily concerned with: When does something follow from something else? What are logical truths? Which arguments are logically valid? We will also look at some results and notions which are important for the applications of formal logic, such as normal forms and expressive power of propositional and first-order logic, and prove, in outline, some important theorems relating semantics and proof theory (soundness, completeness). We will touch on some applications of logic to philosophy and mathematics.

Evaluation

6 homework assignments, a midterm exam, a Registrar-scheduled final exam, and participation in lecture, tutorial, and in discussions on the class website. The lowest homework score will be dropped, the remaining 5 assignments each count 10% towards the final grade. The midterm counts 20%, the final 25%, and discussion participation counts 5%. You must hand in all 6 assignments, and you must take the midterm and final exams to pass the course.

Each assignment will be graded on a scale of 0–100. The final score is then computed according to the percentages given above. The following table will be used to convert the final score to letter grades (the ranges include the lower score and exclude the upper, e.g., 83 earns a B, not a B–):

98–100	A+	87–90	B+	77–80	C+	65–70	D+
93–98	A	83–87	B	73–77	C	60–65	D
90–95	A–	80–83	B–	70–73	C–	< 60	F

The grades will not be curved.

Required Text

Jon Barwise and John Etchemendy, *Language, Proof and Logic*, CSLI/Chicago University Press

The Grade Grinder

The text comes with a CD and a non-transferable use license for software (the "Grade Grinder") which you will be using to prepare your homework assignments. For this reason, you have to buy a new copy of the text. On the CD sleeve you find a registration ID. **Write this ID down in a safe place**—without it, you will not be able to turn in your assignments.

Contents of Software CD

The software CD that comes with the text contains three programs (*Tarski's World*, *Boole*, and *Fitch*) which you will use to complete homework problems. The program *Submit* lets you turn in your completed solutions to the Grade Grinder. The CD also contains the entire textbook in PDF format. **Please take the time to read the software manual.** It contains useful information, in particular, keyboard shortcuts for logical symbols, which will make typing formulas much easier.

Because the text is bundled with software, the book cannot be returned once the seal is broken. If you'd like to take a look at the text before opening yours, you can check out a copy at the Reserves Desk in MacKimmie Library, or come by my office. The software can be run from CD on any computer running Windows, so you can take the CD on reserve up to the Information Commons to play with the software, or later to do your homework. (The software also runs on MacOS, but not directly from CD). LPL is also installed in the TRI Computer Lab in the basement of Social Sciences.

LPL Website

The LPL team maintains a website with helpful information. Check it out at:

http://lpl.stanford.edu/

Among other things, the website contains hints and solutions to selected exercises, and a download area where you can obtain the contents of the CD with your registration ID. Thus, if you lose your CD, you will still have access to the software.

Assignments and Policies

Exercise sets will in general be due on Thursdays at 12 noon. Written parts of the assignment should be dropped off in a box just inside the Philosophy Department (Social Sciences, 12th floor), electronic parts have to be turned in using Submit (one of the four programs in LPL).

Your TAs are in charge of the homework marking; please pick up your marked assignments during tutorial or in office hours from them.

Late work and extensions

The lowest homework score is dropped, this allows you to hand in one assignment late without penalty. Therefore, no late assignments will be accepted for credit. You do, however, have to turn in all six assignments.

There will be no make-up exams under normal circumstances; for the final exam, university policies for deferral of exams apply.

Collaboration

Collaboration on exercises is encouraged. However, you must write up your own solutions. This means that for the electronic parts, **you must create solution files completely from scratch.** The LPL software can tell if you've copied someone else's exercise files. You are also required to list the names of the students with whom you've collaborated on the assignment. **If the Grade Grinder flags an exercise on your assignment as not being created independently (i.e., it is "similar" or "identical" to another student's),**

your assignment and those of whoever you received the file from or gave the file to will receive a score of 0.

You're not allowed to collaborate on the midterm and final exams, of course. Midterm and final will be closed-book. Be aware that cheating on an exam is a serious academic offence and can result in suspension or expulsion.

Participation

5% of your grade will be determined by class participation. This includes participation in discussions on the class website, contributing one point per post to your final score out of 100. Consistent participation in class discussions during lecture or tutorials of course also counts.

Lecture and Tutorial

This class is accompanied by scheduled tutorials. Tutorials are led by Teaching Assistants, who guide you through the material in a more hands-on manner than is possible in lecture. This is where you should go to pick up tips for the assignments, ask questions, go over problems in detail.

To accomodate different learning styles and help needs with homework, tutorial are run in parallel sections. During each of the three time slots on Wednesdays, one TA will hold a traditional, question/answer/example exercise tutorial in the assigned classroom and another will hold a computer-based workshop in TRI Lab section 1 (018 SS). If you have conceptual questions about the material, or questions about the written part of the homwork, you should go to the traditional tutorial; if you just want to sit at the computer and work on the electronic part of the homework under the guidance of a TA, go to the computer lab. You can go back and forth between the two.

Some students find the material relatively easy to pick up on their own, and the software makes self-directed study particularly easy. Note, however, that only very good students can get away with that. Many students who don't attend lecture or tutorial just end up failing the class; thus, although attendance in lecture and tutorial is not mandatory, it is highly encouraged.

Course Website

A course website on U of C's WebCT server has been set up. You should be automatically registered on the first day of class if you're registered in the class. You can find the website at

http://webct-a.ucalgary.ca/

Log in with your UCS user ID and password. (You have a UCS ID if you have a ucalgary.ca email address. The ID is the part before the @; your password is the same password you use to check your email. If it works on webmail.ucalgary.ca, it should work on the WebCT server.) **You must log on at least once by the end of the second week of class.**

If you are not registered in the course on the first day of class, you will be added to the website as soon as you register, provided you have a UCS account. If you don't, you have to get one. You can register for one online at

http://www.ucalgary.ca/it/register/

If you have forgotten your password, you will have to go to the IT Help Desk on the 7th floor of Math Sciences.

What You Have to Do Now

1. Attend lecture and tutorial the first two weeks of class (tutorial starts the second week).
2. Buy the textbook (remember, you need a new copy).
3. Register for a UCS account.
4. Log on to the class website and familiarise yourself with the discussion board.

Three Most Frequently Asked Questions

This is a philosophy course at an introductory level. So it's really easy, right?

No. This is a course in formal logic. Some people (especially science, computer science, and math majors) find the material easy. Some people (including, surprisingly, many computer science majors) find the material very hard. In terms of work required and "feel" it is much more like a math course than a philosophy course. You don't need to know (much) math to do well here, though, but you do need a certain ability to think in abstract terms.

The average grade is about a C+/B–. In Winter 2001, of 137 students registered: 27 got an A or A– (3 would have gotten A+'s, which are official grades at U of C starting Fall 2002); 48 between B– and B+; 20 between C– and C+; 8 a D or D+; 4 of those taking the final exam got F's; 26 withdrew. If you're worried that only science majors do well here: the top students in 2001/02 included majors in: fine art, religious studies, philosophy, and management.

So how much work does it require?

It is not unusual for students to spend 10-15 hours on an assignment. It takes less time if you keep on top of the reading and do the assignments as we cover the material in class. Some students aren't very good at budgeting time and leave assignments to a day before the due date. Then it certainly will take a lot of time, and it will be difficult to complete the assignment.

10–15 hours per assignment isn't that much on average. With six assignments, this works out to about 5–7 hours a week, or about 2 hours per our spent in class. The rule of thumb for class work in North American universities is 3 hours of work outside of class for every hour in class, so that leaves you another three hours a week to read the book, review the lecture notes, etc.

What's with the grade scale? 60 points for a D, 93 for an A! That's harsh!

In many courses (including other sections of PHIL 279/377) the grade scale is set so that 50 is a D, and sometimes anything over 90 is an A. In these courses, however, it is much harder to attain these percentages. In this course, your assignments count for 50 of the final grade, in others it is usually much less. It is easier in general to score well on homework assignments: there is no time pressure, you have textbook and notes available, and you can talk to the instructors about the problems. In this course, in addition, you are encouraged to collaborate with your colleagues, and the final score is the average of your five best assignments (lowest score dropped). Also, since about 75% of the problems are done on the computer, you can have the computer check your solutions before you submit them. Thus, for 75% of your assignments, there is almost no reason other than lack of time for you not to get a perfect score. In addition, 5% of your grade consists in participation (in class, on the website). That is another 5% which are (almost) "free."

So, the grade scale, although it "looks" harsh, is in fact just as harsh (or lenient) as in other courses. Experience shows that the grade scale, as it stands, results in a perfectly average grade distribution, and the final letter grades students receive on the whole corresponds closely to the definitions of those letter grades in the University Calendar).

More questions and answers at http://www.ucalgary.ca/~rzach/279/.

Syllabus

This is a tentative syllabus to give you a rough idea what parts of the book we will cover when. The assignment and midterm dates are firm, however.

Week 1 (Sept 10, 12): The language of FOL (Ch. 1). Arguments, Logical validity. The logic of atomic sentences (Ch. 2)

Week 2 (Sept 17, 19): More logic of atomic sentences (Ch. 2). The Boolean connectives. Translation using Boolean connectives (Ch. 3). The logic of Boolean connectives: truth tables (Ch. 4)

Tutorials and workshops start Wednesday, Sept 18.

Week 3 (Sept 24, 26): More truth tables. Conjunctive and disjunctive normal form (Ch. 4). Informal proofs using Boolean connectives (Ch. 5).

You must complete the "You try it" exercise on pp. 8–10 of the text and submit "World Submit Me 1" by Tuesday, September 24, midnight.

Assignment 1 due Thursday, September 26 (covers Ch. 1–3)

Week 4 (Oct 1, 3): Formal proofs using Boolean connectives (Ch. 6)

Week 5 (Oct 8, 10): Conditionals (Ch. 7). Proofs with conditionals (Ch. 8)

Assignment 2 due Thursday, October 10 (covers Ch. 4–5, parts of 6)

Week 6 (Oct 15, 17): More formal proofs (Ch. 8). Truth-functional completeness (Sec. 7.4).

Week 7 (Oct 22, 24): Quantifiers. The Aristotelian forms. Simple translations (Ch. 9)

Assignment 3 due Thursday, October 24 (covers Ch. 6–8)

Week 8 (Oct 29, 31): First-order validity and consequence. First-order interpretations. (Ch. 10)

Midterm exam in class, Tuesday, October 29

Week 9 (Nov 5, 7): DeMorgan's Laws for quantifiers (Ch. 10). Multiple quantification (Ch. 11).

Assignment 4 due Thursday, November 7 (covers Ch. 9–10)

Week 10 (Nov 14): More multiple quantification. Complex translations. Prenex form (Ch. 11).

No class Nov 12.

Week 11 (Nov 19, 21): More first-order interpretations (Ch. 11). Formal proofs (Sec. 18.1; Ch. 13)

Assignment 5 due Thursday, November 21 (covers Ch. 10–11)

Week 12 (Nov 26, 28): More Formal Proofs. Numerical Quantification and Definite Descriptions (Ch. 13, Sec. 14.1, 14.3)

Week 13 (Dec 3, 5): Soundness (Sec 8.3), Review and Outlook

Assignment 6 due **Tuesday, December 10** (covers Ch. 13, Sec. 14.1–2, Sec. 8.3)