Phil 2310: Introduction to Deductive Logic

Fall 2011, Cornell University

Time:	10:10am-11:25am, Tuesday & Thursday
Place:	Uris Hall 202
Website:	Blackboard
Professor:	Dr. William Starr (will.starr@cornell.edu)
Office:	Goldwin Smith Hall, Office 237
Office Hours:	Thursdays 3:40-4:40; by appointment

Course Description:

What makes one claim follow from others? If you claim 'Someone was happy' it follows from this claim that not everyone was sad. Why is that? What is it for one claim to follow from another? Logic aims to address these questions. Formal Logic approaches these questions using some mathematical techniques that we will meet and begin to master in this course. In particular, we will study a powerful artificial language called **First-Order Logic** (FOL) that will allow us to precisely formulate the concepts of proof, truth and valid deductive inference. FOL has been of immense foundational importance to mathematics, philosophy, computer science, linguistics and artificial intelligence, and so through FOL we will be encountering ideas of interest to all of these disciplines. Our study of FOL will focus on using it to represent and evaluate the inferences we normally express in ordinary English. This will also force you to examine those inferences in detail and improve your understanding of how they do and don't work. Throughout the course we will rely heavily on the interactive computer software included with the textbook to solidify the understanding of logic that can be achieved by studying FOL.

Textbook:

The text/software package *Language, Proof and Logic* by Jon Barwise & John Etchemendy (Barwise & Etchemendy 2003)

- The text has a webpage that is likely to be useful throughout the course: http://ggweb.stanford.edu/lpl
- It is available at the Cornell Bookstore and from Amazon
  Beware: it *cannot* be purchased used. The software requires a license that can only be used for one person and cannot be transferred. We will be using the software extensively.
- If you do not have regular access to a computer that you can run the software on, please contact me immediately and we will consider various options. You can run the software directly from the CD so you can use it on a computer without installing anything; e.g. in campus labs.
- In order to be successful in this course, you will have to do the assigned reading and play with the software until you feel comfortable using it.

Grading:

- **40%:** 2 Exams (Midterm: 15%, Final 25%)
- **54%:** 12 Short, Weekly Homework Assignments (4.5% each)
- **6%:** Attendance & Participation

- We will do in-class group exercises. I will randomly call on students to present their group's solution. If you aren't here when I call your name, you loose participation points. To excuse such an absence, you are required to provided a documented excuse, e.g. a doctor's note, or a note from guardian in case of family emergency.

Schedule

Date	Homework Exercises	Reading	Topics
Week 1			*Introduction*
08.25	**Class Cancelled**	**Class Cancelled**	**Class Cancelled**
Week 2			*Introduction*
08.30		1.1-1.4	Atomic Sentences & Tarski's World
09.01		2.1, 2.2	Logical Consequence, Proof
Week 3			*The Concepts of Logic*
09.06		2.3-2.5	Proof, Fitch
09.08		3.1-3.7	Meet the Booleans: $\wedge, \vee, \neg$
Week 4			*Boolean Logic*
09.13	HW1 & HW2 Due	4.1	Tautologies, Logical Truths
09.15		4.2-4.4	Consequence & Equivalence
Week 5			*Boolean Logic & Proofs*
09.20	HW3 Due	5.1-5.2	Informal Boolean Proofs
09.22		5.3-5.4	Indirect Proof
Week 6			*Boolean Proofs*
09.27	HW4 Due	6.1, 6.2	Conjunction, Disjunction
09.29		6.3-6.5	Negation, Subproofs
Week 7			*More Proofs & Conditionals*
10.04	HW5 Due	7.1-7.3,7.5	Conditionals
10.06		8.1, 8.2, 8.4	Conditional Proofs
Week 8			*Review, Midterm*
10.11	HW6 Due		Review of Ch.'s 1-8
10.13			**Midterm**
Week 9			*Midterm, Quantification*
10.18		9.1-9.3	Basics of Quantification
10.20		9.3, 9.4	Basics of Quantification
Week 10			*Intro to Quantification*
10.25	HW7 Due	9.5, 9.6	Translation
10.27		10.1-10.4	Taut, Cons, Equiv

Date	Homework Exercises	Reading	Topics
Week 11			*Logic of Quantification*
11.01	HW8 Due	11.1-11.3	Multiple, Mixed Quant.'s
11.03		11.4, 11.5, 11.8	More Translation
Week 12			*Translation, Proofs*
11.08	HW9 Due	12.1, 12.2	Steps, Existential Instantiation
11.10		12.3	General Proofs
Week 13			*Quantifiers in Proofs*
11.15	HW10 Due	12.4	Mixed Proofs
11.17		13.1	$\forall$ Rules
Week 14			*Formal Proofs*
11.22	HW11 Due	13.2	$\exists$ Rules
11.24	**No Class**	**No Class**	**Thanksgiving Break**
Week 15			*Formal Proofs, Review*
11.29		13.3	Strategy & Tactics
12.01	HW12 Due	13.5	Review
12.06	No Class	No Class	Study Period
12.08	No Class	No Class	Exams
12.12 (Mon)	Take-Home Final Due		Final Exam, 9-11:30am

Homework

Homework assignments are given out on Tuesdays and due **by the beginning of class** on the following Tuesday. Many exercises will be submitted electronically. This means that you must submit these exercises **before** class. Each assignment is worth 100 points and consists of 5 problems, each worth 20 points. Partial credit **is** given. A list of the assignments and a **rough** break down of the grading scale is given below.

Homework Assignments

HW1: 1.1-4, 2.1, 2.2, 2.6, 2.8

HW2: 2.20, 2.25, 3.6, 3.9, 3.23,

HW3: 4.2, 4.7, 4.12, 4.22, 4.23

HW4: 5.5, 5.8, 5.10, 5.17, 5.20

HW5: 6.2, 6.6, 6.7, 6.22, 6.26

HW6: 7.12, 7.13, 8.17, Practice Midterm

HW7: 9.1, 9.2, 9.3. 9.5, 9.6,

HW8: 9.16, 9.17, 10.9, 10.14, 10.18

HW9: 11.8, 11.9, 11.17, 11.24, 11.39

HW10: 12.4, 12.5, 12.7, 12.8, 12.9

HW11: 12.11, 12.16, 12.23, 13.3, 13.8

HW12: 13.10, 13.11, Practice Final

Homework Grading Scale

- A: 100-95: 0-1 minor errors, 94-90: 1-2 minor errors
- B+: 89-85: 3-4 minor errors
- B: 84-80: 5-6 minor errors or 1 major error
- C+: 79-75: 6-7 minor errors or 1 major & 1-2 major errors
- C: 74-70: 8-9 minor errors or 1 major & 3-4 minor errors
- D: 69-60: 10-11 minor errors or 2 major errors
- F: 59-0: 12-13 minor errors or 3 major errors

There is clearly a bit of art to classifying mistakes as major or minor, and even to counting mistakes for that matter. If you disagree with or are confused about the grade on your assignments, please bring the graded assignment to my office hours.

As for **late homework**, here is the official policy.

Late Homework Policy

- With a documented excuse, you can turn in homework late without being penalized
- *1-3 Days Late*: 10 point penalty (i.e. one letter grade)
- *4-6 Days Late*: 20 point penalty (i.e. two letter grades)
- And so on, with 10 points every 3 days

Academic Integrity:

In this course we will strictly adhere to the University Policy on Academic Integrity. If you are not familiar with it, view it at: http://cuinfo.cornell.edu/Academic/AIC.html ANY VIOLATION OF THIS POLICY WILL BE REPORTED IMMEDIATELY. Violations will, at the very least, result in an F on the assignment in question, but may also to lead to an F in the class, suspension, being expelled and other penalties.

Exams

If you miss an exam you will need a documented excuse to make it up.

References

BARWISE, J. & ETCHEMENDY, J. (2003). *Language, Proof, and Logic*. New edn., Stanford, California: CSLI Publications. http://www-csli.stanford.edu/LPL/