

PHIL 220A (004) – Symbolic Logic

Winter Term 2, 2016 – 17

Mon, Wed, Fri, 10:00 – 11:00

Hugh Dempster Pavilion (DMP), Room 110

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Course description

This course examines the main elements of deductive logic, which is primarily concerned with correctly deducing a conclusion from given premises, or what is often called “valid inference”, “logical consequence”, or “following logically from”. These ideas are introduced using a special language, FOL, which abbreviates “first-order logic”. We develop this language first using a special case, where we have names for objects and then what we call “predicates” of those objects, corresponding to properties and simple relations. This gives rise to elementary sentences. We then look at some ways to connect them—with what we call “connectives”—to form more complex sentences. This yields what is often called “(classical) propositional logic” an important part of logic expressed in a fragment of FOL. We give a precise definition of “valid inference”/“logical consequence” here. We then proceed to develop a proof system (a system of deduction) for this, i.e., a way of deriving logical consequences from given sentences as a starting point. We end the course by looking at a more complex version of FOL, based on quantifiers and variables, which gives a correspondingly more complex means of expression, and along with this we expand to a correspondingly more complex system of deduction.

Required Text

Language, Proof, and Logic, 2nd ed., (eds.) Dave Barker-Plummer, Jon Barwise, and John Etchemendy, The University of Chicago Press, 2011

This book will be available for purchase at the *UBC Bookstore*.

Please **note** that this is the **second edition** of the book. Because of a difference in pagination, I strongly discourage you from getting a copy of the first edition (used or new).

Evaluation

- Three (3) assignments (1st and 2nd worth 12.5% each, 3rd worth 15%, 40% total)
- Midterm exam (17.5%)
- Final exam (37.5%)
- Participation (5%)

The exposition in the lectures will follow that of the textbook, which means that the **textbook is indispensable**, and regular reading of it is **essential**.

Formal logic is very much a subject where practice is essential, and where the exercises really instil familiarity with the material. Examples are to be found in abundance in the textbook, and should be worked through as a matter of routine, without being instructed to do so. The questions on the exams and assignments will be somewhat similar in form to these. Some of them will be challenging, thus, not just asking you to regurgitate what you have learnt, but to use this in ways which might not be entirely familiar.

Warning

Many students standardly find the second half of the course much more difficult and complicated than the first part. Thus, finding the initial stages easy is not a sign that you will find the whole course so. Understanding the material is also by its nature cumulative; one cannot neglect the course for a few classes, and then expect to understand the new material.

Handouts, slides etc.

Handouts, slides, and assignments will be distributed via *Connect*; announcements will also be distributed through the announcement functions available here: thus, check *Connect* routinely.

Software

The book comes with a CD, which contains software essential for many of the exercises. There are 4 software programs which are used to practice various aspects of the course, and a bank of files based on these programs. (The disc also contains a PDF copy of the software manual, as well as of the textbook itself.) 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, which you'll be encouraged to use. It is also strongly advised: (a) to copy the disc to your hard-drive (b) make a careful note of the registration number on the CD, to be kept in a safe place (perhaps also e-mailed to yourself); (c) make a disc-copy of the CD for safe keeping; and (d) arrange for regular computer time if you do not possess your own computer. Please read carefully the section *Essential Instructions about Homework Exercises*, pp. 5–10 of the book. Please specify only your *own* e-mail address for the 'Submit' function.

Participation

As stated above, your participation in the course counts for 5% of your final mark. There are no specific criteria by which I evaluate student participation. Your participation in this course will be evaluated holistically. That is, there are various ways one can obtain participation marks. These include, but are not limited to the following: active contribution in class, asking questions, offering comments, and generally engaging with the course material.

Policy on Lateness

Assignments which are turned in late without an extension will be penalized at the rate of 5% *per calendar day*. No extensions will be given on the assignments except for medical reasons. The deadline for requesting an extension is one business day before an assignment is due. Differed exams will not be considered except for medical reasons.

Academic honesty and integrity

Here is a statement from the UBC website:

“Academic honesty is essential to the continued functioning of the University of British Columbia as an institution of higher learning and research. All UBC students are expected to behave as honest and responsible members of an academic community. Breach of those expectations or failure to follow the appropriate policies, principles, rules, and guidelines of the University with respect to academic honesty may result in disciplinary action.

It is the student's obligation to inform himself or herself of the applicable standards for academic honesty. Students must be aware that standards at the University of British Columbia may be different from those in secondary schools or at other institutions. If a student is in any doubt as to the standard of academic honesty in a particular course or assignment, then the student must consult with the instructor as soon as possible, and in no case should a student submit an assignment if the student is not clear on the relevant standard of academic honesty. If an allegation is made against a student, the Registrar may place the student on academic hold until the President has made his or her final decision. When a student is placed on academic hold, the student is blocked from all activity in the Student Service Centre.”

Students should also familiarise themselves with UBC regulation on plagiarism:

“Plagiarism, which is intellectual theft, occurs where an individual submits or presents the oral or written work of another person as his or her own. Scholarship quite properly rests upon examining and referring to the thoughts and writings of others. However, when another person's words (i.e. phrases, sentences, or paragraphs), ideas, or entire works are used, the author must be acknowledged in the text, in footnotes, in endnotes, or in another accepted form of academic citation. Where direct quotations are made, they must be clearly delineated (for example, within quotation marks or separately indented). Failure to provide proper attribution is plagiarism because it represents someone else's work as one's own. Plagiarism should not occur in submitted drafts or final works. A student who seeks assistance from a tutor or other scholastic aids must ensure that the work submitted is the student's own. Students are responsible for ensuring that any work submitted does not constitute plagiarism. Students who are in any doubt as to what constitutes plagiarism should consult their instructor before handing in any assignments.”

See the following link for further information about academic dishonesty and plagiarism:

<http://www.calendar.ubc.ca/vancouver/?tree=3,54,111,959>

Provisional Reading Schedule

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Date	Topic	Readings (pages)	Exercises
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Week 1			
Wed. 4 Jan.	▪ Introduction	▪ 5 - 11	
Fri. 6	▪ FOL and atomic sentences (ch. 1)	▪ 19 - 25, 28 - 29, 31 - 34, 38 - 39	▪ 1.1 - 1.7, 1.8 - 1.11, 1.12 - 1.18, 1.20 - 1.21

Week 2			
Mon. 9	▪ Cont'd.	▪ Cont'd.	▪ Cont'd.
Wed. 11	▪ The logic of atomic sentences (ch. 2)	▪ 41 - 44, 46 - 52, 54 - 64	▪ 2.1 - 2.4, 2.5 - 2.14, 2.15 - 2.20, 2.21 - 2.27
Fri. 13	▪ Cont'd.	▪ Cont'd.	▪ Cont'd.

Week 3			
Mon. 16	▪ The Boolean connectives (ch. 3)	▪ 67 - 69, 71 - 72, 74 - 76, 77 - 80, 82 - 86	▪ 3.1 - 3.3, 3.5 - 3.7, 3.8 - 3.10, 3.12 - 3.17, 3.18 - 3.19, 3.20 - 3.24
Wed. 18	▪ Cont'd.	▪ Cont'd.	▪ Cont'd.
Fri. 20 1 st assignment posted on Connect	▪ The Logic of Boolean connectives (ch. 4)	▪ 93 - 103, 106 - 116, 118 - 121, 122 - 125	▪ 4.1 - 4.11, 4.12 - 4.19, 4.20 - 4.25, 4.26 - 4.30, 4.31 - 4.37, 4.39 - 4.43

Week 4			
Mon. 23	▪ Cont'd.	▪ Cont'd.	▪ Cont'd.
Wed. 25 1 st assignment due at the beginning of class	▪ Cont'd.	▪ Cont'd.	▪ Cont'd.
Fri. 27	▪ Cont'd.	▪ Cont'd.	▪ Cont'd.

Week 5			
Mon. 30	▪ Methods of proof for Boolean logic (ch. 5)	▪ 128 - 131, 132 - 135, 137 - 139, 141 - 142	▪ 5.1 - 5.6, 5.7 - 5.11, 5.14, 5.15 - 5.20, 5.21 - 5.26, 5.27
Wed. 1 Feb.	▪ Cont'd.	▪ Cont'd.	▪ Cont'd.
Fri. 3	▪ Formal proofs for Boolean logic (ch. 6)	▪ 143 - 155, 156 - 163, 165 - 167, 168 - 173, 175 - 176	▪ 6.1 - 6.6, 6.7 - 6.16, 6.17 - 6.20, 6.21 - 6.32, 6.33 - 6.42

Week 6			
Mon. 6	▪ Cont'd.	▪ Cont'd.	▪ Cont'd.

Wed. 8	▪ Cont'd.	▪ Cont'd.	▪ Cont'd.
Fri. 10	▪ Conditionals (ch. 7)	▪ 178 - 185, 192 - 196	▪ 7.1 - 7.21, 7.25 - 7.27, 7.28, 7.29 - 7.31

Week 7			
Mon. 13	▪ Family Day	▪ University closed	
Wed. 15	▪ Cont'd.	▪ Cont'd.	▪ Cont'd.
Fri. 17	▪ In-class Midterm		

Reading Week			
Mon. 20		No classes	
Wed. 22		No classes	
Fri. 24		No classes	

Week 8			
Mon. 27 2 nd assignment posted on Connect	▪ The logic of conditionals (ch. 8)	▪ 199 - 204, 207 - 213, 215 - 222	▪ 8.1 - 8.9, 8.13, 8.16, 8.17 - 8.38, 8.41 - 8.42, 8.44 - 8.53
Wed. 1 Mar.	▪ Cont'd.	▪ Cont'd.	▪ Cont'd.
Fri. 3 2 nd assignment due at the beginning of class	▪ Cont'd.	▪ Cont'd.	▪ Cont'd.

Week 9			
Mon. 6	▪ Introduction to quantification (ch. 9)	▪ 229 - 236, 237 - 241, 241 - 243, 245 - 249, 253 - 255	▪ 9.1 - 9.3, 9.4 - 9.7, 9.8 - 9.13, 9.15 - 9.20, 9.22 - 9.25
Wed. 8	▪ Cont'd.	▪ Cont'd.	▪ Cont'd.
Fri. 10	▪ Cont'd.	▪ Cont'd.	▪ Cont'd.

Week 10			
Mon. 13	▪ The logic of quantifiers (ch. 10)	▪ 259 - 265, 267 - 275, 277 - 281, 282 - 285	▪ 10.1 - 10.7, 10.8 - 10.9, 10.10 - 10.19, 10.20 - 10.22, 10.23 - 10.2
Wed. 15	▪ Cont'd.	▪ Cont'd.	▪ Cont'd.
Fri. 17	▪ Cont'd.	Cont'd.	▪ Cont'd.

Week 11			
Mon. 20	▪ Multiple quantifiers (ch. 11)	▪ 298 - 300, 302 - 305, 307, 309 - 311, 317 - 318, 320 - 323	▪ 11.1 - 11.7, 11.8 - 11.15, 11.16 - 11.17, 11.18 - 11.20, 11.29 - 11.30, 11.33 - 11.38
Wed. 22	▪ Cont'd.	▪ Cont'd.	▪ Cont'd.
Fri. 24	▪ Cont'd.	▪ Cont'd.	▪ Cont'd.

Week 12			

Mon. 27 3 rd assignment posted on Connect	<ul style="list-style-type: none"> ▪ Numerical quantification (ch. 14) 	<ul style="list-style-type: none"> ▪ 375 - 380, 388 - 390 	<ul style="list-style-type: none"> ▪ 14.1 - 14.4, 14.26 - 14.28
Wed. 29	<ul style="list-style-type: none"> ▪ Cont'd. 	<ul style="list-style-type: none"> ▪ Cont'd. 	<ul style="list-style-type: none"> ▪ Cont'd.
Fri. 31 3 rd assignment due at the beginning of class	<ul style="list-style-type: none"> ▪ Methods of proof for quantifiers (ch. 12) 	<ul style="list-style-type: none"> ▪ 328 - 336, 338 - 343 	<ul style="list-style-type: none"> ▪ 12.1 - 12.3, 12.4 - 12.10, 12.11- 12.15 - 12.18, 12.19 - 12.22

Week 13			
Mon. 3 Apr.	<ul style="list-style-type: none"> ▪ Formal proofs and quantifiers (ch. 13) 	<ul style="list-style-type: none"> ▪ 351 - 355, 357 - 359, 361 - 367 	<ul style="list-style-type: none"> ▪ 13.1 - 13.9, 13.10 - 13.18, 13.19 - 13.39, 13.40 - 13.52
Wed. 5	<ul style="list-style-type: none"> ▪ Cont'd. 	<ul style="list-style-type: none"> ▪ Cont'd. 	<ul style="list-style-type: none"> ▪ Cont'd.

Exam period:

April 10 – 28