

PHILOSOPHY 296

HONORS INTRODUCTION TO LOGIC

Mondays, Wednesdays, and Fridays, 2–3 pm  
2407 Mason Hall

INSTRUCTOR

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AIMS OF THE COURSE

We will study two artificial languages—called *propositional logic* and *first-order logic*—and thereby gain a better understanding of

- the principles and techniques of good reasoning,
- the distinctive features of natural languages,
- the foundations of mathematics,
- the fundamental philosophical notions of meaning, truth, and proof.

COURSE WEB SITE

Go to <http://ctools.umich.edu>, click 'Sites' and scroll down to 'Honors-Logic.'

GRADING

- Homework: 60%. I'll ignore your *lowest* homework grade.
- Midterm exam: 10%
- Final exam: 20%
- Attendance and in-class participation: 10%

Homework is due at the start of class. You get credit for late homework only if you give a really good explanation for its being late. I encourage you to discuss homework exercises with other students in the class. But you may not copy others' work, and you may not share files. I strongly recommend that you do the 'You try it' exercises in the book for your own benefit. They're good practice, and not difficult.

SCHEDULE—REVISED IN NOVEMBER

This schedule is subject to some change. In particular: we can slow down if we're going too fast. Please don't let yourself fall behind. It's difficult to catch up in a class like this.

9/6	<b>Background, syllabus, software</b> For next time read: pp. 1–10, §1.1–§1.4, the software manual as necessary
9/8	<b>Constants, predicates, atomic sentences, first-order languages</b> For next time read: §2.1–§2.2 For next time submit: 1.2, 1.3, 1.4, 1.5, 1.9
9/11	<b>Validity, soundness, methods of proof</b> For next time read: §2.3–§2.6
9/13	<b>Formal proofs, Fitch, demonstrating nonconsequence</b> For next time read: §3.1–§3.4 For next time submit: 2.1, 2.4, 2.8–2.11, 2.16–2.19, 2.24–2.26
9/15	<b>Boolean connectives</b> For next time read: §3.5–§3.7
9/18	<b>Ambiguity, translation</b> For next time read: §4.1–§4.2 For next time submit: 3.2, 3.3, 3.6, 3.7, 3.9, 3.13–3.16, 3.18, 3.20–3.21
9/20	<b>Tautologies, logical truth, equivalence</b> For next time read: §4.3–§4.4
9/22	<b>Consequence, Fitch</b> For next time read: §5.1–§5.2 For next time submit: 4.2, 4.4–4.6, 4.12, 4.14–4.15, 4.17–4.18, 4.20, 4.22, 4.23, 4.27–4.29, 4.30
9/25	<b>Methods of proof: valid steps, proof by cases</b> For next time read: §5.3–§5.4
9/27	<b>Methods of proof: indirect proof, inconsistent premises</b> For next time read: §6.1–§6.2 For next time submit: 5.4, 5.5, 5.8, 5.9, 5.13, 5.17, 5.18, 5.21
9/29	<b>Conjunction and disjunction rules</b> For next time read: §6.3–§6.4
10/2	<b>Negation rules, subproofs</b> For next time read: §6.5–§6.6
10/4	<b>Strategy, proofs without premises</b> For next time read: §7.1–§7.2 For next time submit: 6.2, 6.3–6.6, 6.7–6.12, 6.15, 6.19, 6.20, 6.29–6.31, 6.33, 6.37, 6.38, 6.40, 6.41

10/6	<b>Review</b>
10/9	<b>Conditionals and biconditionals</b> For next time read: §7.3–§7.5
10/11	<b>Implicature, truth-functional completeness</b> For next time read: §8.1–§8.2 For next time submit: 7.6–7.8, 7.11, 7.12, 7.15, 7.23, 7.25, 7.29
10/13	<b>Informal and formal proof with conditionals</b> For next time read: §8.3–§8.4
10/16	<b>No class (fall study break)</b>
10/18	<b>Soundness and completeness, review</b> For 10/23 read: §9.1–§9.3 For 10/23 submit: 8.9, 8.12, 8.18–8.27, 8.31–8.37, 8.45–8.47, 8.49, 8.51, 8.53
10/20	<b>Midterm exam (in class)</b>
10/23	<b>Introducing quantifiers</b> For next time read: §9.4
10/25	<b>Semantics for quantifiers</b> For next time read: §9.5–§9.6
10/27	<b>Aristotelian forms; complex noun phrases</b> For next time read: §10.1–§10.2 For next time submit: 9.1–9.3, 9.5–9.6, 9.9–9.13, 9.16–9.18
10/30	<b>The logic of quantifiers</b> For next time read: §10.3
11/1	<b>DeMorgan's laws for quantifiers</b> For next time read: §11.1–§11.2 For next time submit: 10.1, 10.2, 10.4, 10.6, 10.7, 10.9, 10.10–10.19, 10.20–10.22
11/3	<b>Multiple quantifiers, mixed quantifiers</b> For next time read: §11.3–§11.5
11/6	<b>Translation tips and tricks</b> For next time read: §12.1–§12.3 For next time submit: 11.2–11.7, 11.9–11.12, 11.16–11.17, 11.18, 11.20–11.22, 11.25–11.28
11/8	<b>Informal proof: Existential instantiation, conditional proof</b> For next time read: §12.4
11/10	<b>Informal proof: Mixed quantifiers</b> For next time read: §13.1–§13.2 For next time submit: 12.1–12.10, 12.11–12.21
11/13	<b>Formal proof: Universal and existential rules</b> For next time read: §13.3–§13.5

11/15	<b>Strategy, soundness and completeness</b> For next time read: §14.1–§14.2 For next time submit: 13.2–13.8, 13.11–13.18, 13.20–13.27, 13.32–13.39, 13.40–13.50, 13.52, 13.53
11/17	<b>Numerical quantification; numerical proof</b> For next time read: §14.3–§14.4
11/20	<b>Some English determiners</b> For next time read: §15.1–§15.2 For next time submit: 14.2–14.7, 14.10–14.13, 14.16–14.18, 14.26–14.28, 14.30–14.32
11/22	<b>Class canceled for Thanksgiving break</b>
11/24	<b>No class – Thanksgiving break</b>
11/27	<b>Naive set theory</b> For next time read: §15.3–§15.4
11/29	<b>Intersection, union, sets of sets</b> For next time read: §15.5, §1.5, and §15.6
12/1	<b>Relations, functions</b> For next time read: §15.7–§15.8 (§15.9 is optional, and hard, but very cool)
12/4	<b>Power sets, Russell’s Paradox</b> For next time read: §16.1–§16.2 (I wish we had time to do §16.3–16.4. If you’re interested in math, read them.) For next time submit: 15.1, 15.3–15.5, 15.8–15.13, 15.15–15.19, 15.23, 15.24, 15.26, 15.27, 15.29–15.36, 15.38, 15.40, 15.42, 15.47, 15.50–15.53, 15.54, 15.56–15.61
12/6	<b>Mathematical induction</b> For next time read: §17.1–§17.2
12/8	<b>Truth assignments, completeness for propositional logic</b> For next time read: §18.1–§18.2
12/11	<b>First-order structures; truth and satisfaction in FOL</b> For next time read: §19.8 For next time submit: 16.1–16.6, 16.8–16.10, 16.11–16.13, 17.2, 17.3, 17.5–17.7, 17.11–17.16, 18.1–18.3, 18.7–18.10, 18.13
12/13	<b>A thumbnail sketch of Gödel’s incompleteness proof</b>
12/13–12/17	<b>Two optional review sessions; times TBA</b>
12/18	<b>Final exam, 1:30-3:30</b>