



PHIL 205: Introduction to Logic & Formal Reasoning

Term: Fall 2026

Credits: 3.0

Lecture Times & Location: Tuesday & Thursday 4:00–5:15 p.m., Lovell Hall 140

Modality: In-Person

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Instructor Information

- **Instructor:** Dr. Brendan Walsh (Associate Professor of Philosophy)
- **Email:** bwalsh@university.alkimi.ai
- **Office:** Lovell Hall 240
- **Office Hours:**
 - Wednesday & Friday: 10:00–11:30 a.m. (In person, Lovell Hall 240)
 - Thursday: 3:00–4:00 p.m. (Virtual via Zoom; link posted in Canvas)
 - Also available by appointment.

Course Description

Argument analysis, informal fallacies, propositional logic, truth tables, natural deduction, and first-order predicate logic, with applications to scientific and legal reasoning. PHIL 205 provides a rigorous, systematic introduction to symbolic logic, deductive inference, and the formal analysis of reasoning. Students develop proficiency in translating natural language arguments into formal propositional notation, evaluating argument validity through truth tables, and constructing formal syntactic proofs using natural deduction rules. Moving beyond propositional logic, the course covers monadic and polyadic first-order predicate logic with quantifiers, concluding with practical applications to legal evidentiary structures and scientific hypothesis testing.

Prerequisites

None.

Measurable Student Learning Outcomes

Upon successful completion of PHIL 205, students will be able to:

1. **Analyze Informal and Formal Arguments:** Identify argument structures in ordinary language, differentiate deductive validity from inductive strength, and diagnose informal logical fallacies.
2. **Evaluate Arguments Using Truth Tables:** Translate English statements into truth-functional propositional formulas and construct direct and indirect truth tables to assess validity and consistency.
3. **Construct Natural Deduction Proofs:** Execute formal syntactic derivations in propositional logic using eighteen rules of inference and replacement, conditional proof, and indirect proof.
4. **Formalize Predicate Logic:** Translate complex categorical propositions and relational claims into first-order predicate logic with universal and existential quantifiers.

5. **Apply Formal Logic to Law and Science:** Utilize formal logical methods to evaluate legal statutory interpretation, constitutional argumentation, and hypothetical-deductive scientific confirmation.

Required Course Materials & Approximate Costs

1. **Patrick J. Hurley and Lori Watson. *A Concise Introduction to Logic*. 13th ed., Cengage Learning, 2018.** Approx. \$55 digital rental, \$110 print purchase.
2. **Alkimi Logic Practice Workbook and Proof Verification Tools.** Free digital proof-checking software access on Canvas.
3. **Total estimated cost:** \$55 to \$110.

Generative AI Policy (AI Level 1: AI Not Permitted for Graded Work)

In accordance with Alkimi University Academic Policies (Student Handbook §5.8), PHIL 205 operates under **AI Level 1**.

- **What is permitted:** You may use generative AI tools to look up historical definitions of informal logical fallacies or review typographical conventions for formal logic symbols.
- **What is prohibited:** You may not use generative AI to solve translation problems, construct truth tables, compute natural deduction proofs, or answer examination and quiz questions.
- **Disclosure:** All submitted logic problem sets must include an academic integrity declaration certifying: 'I certify that all formal derivations, proofs, and truth tables were constructed independently without AI tools.'

Grading Components and Weights

- **Midterm Examination 1:** 20% (In class, Thursday, September 24)
- **Midterm Examination 2:** 20% (In class, Thursday, October 29)
- **Formal Logic Problem Sets:** 25% (Ten weekly formal logic problem sets submitted via Canvas on Fridays at 11:59 p.m.; lowest two dropped)
- **In-Class Deduction Quizzes:** 10% (Short weekly proof and translation checks completed in class during Thursday sessions)
- **Comprehensive Final Examination:** 25% (Thursday, December 17, 2026, 3:30–5:30 p.m.)

Grading Scale (Alkimi University Standard)

- **A:** 93–100% | **A-:** 90–92%
- **B+:** 87–89% | **B:** 83–86% | **B-:** 80–82%
- **C+:** 77–79% | **C:** 73–76% | **C-:** 70–72%
- **D+:** 67–69% | **D:** 60–66% | **F:** Below 60%
- **Extra credit:** No extra credit assignments are offered in PHIL 205. Thorough engagement with the weekly homework problem sets is the key to success.

Course Schedule (Fall 2026)

Week	Dates	Topics & Readings	Assignments & Deadlines
Week 1	Aug 27	Basic Concepts of Logic and Argument Structure: Arguments, premises, and conclusions; identifying indicators; distinguishing deductive arguments from inductive arguments; validity, truth, and soundness. <i>Reading: Hurley & Watson, Ch. 1 (1.1–1.4)</i>	<i>First day of classes: Wed Aug 26.</i>
Week 2	Sep 1, 3	Argument Diagramming and the Counterexample Method: Inductive strength and cogency; argument diagramming techniques; counterexample method for demonstrating	<i>Wed Sep 2: Add/section change deadline.</i>

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		invalidity in natural language. <i>Reading: Hurley & Watson, Ch. 1 (1.5–1.6)</i>	
Week 3	Sep 8, 10	Informal Fallacies: Fallacies of Relevance: Fallacies of relevance: appeal to force, appeal to pity, appeal to the people, ad hominem, accident, straw man, missing the point, and red herring. <i>Reading: Hurley & Watson, Ch. 3 (3.1–3.2)</i>	<i>Mon Sep 7: Labor Day (no classes). Wed Sep 9: Census date (last day to drop without a W).</i>
Week 4	Sep 15, 17	Informal Fallacies: Weak Induction and Ambiguity: Fallacies of weak induction, presumption, ambiguity, and grammatical analogy (begging the question, false dichotomy, equivocation, amphiboly). <i>Reading: Hurley & Watson, Ch. 3 (3.3–3.5)</i>	—
Week 5	Sep 22, 24	Propositional Logic: Symbols, Translation, and Midterm 1: Logical operators, negation, conjunction, disjunction, material implication, biconditional; translation from English; Midterm Examination 1 in class. <i>Reading: Hurley & Watson, Ch. 6 (6.1–6.2)</i>	Midterm Examination 1 (in class).
Week 6	Sep 29, Oct 1	Truth Tables for Propositions and Semantic Equivalences: Computing truth values of compound propositions; constructing truth tables for statements: tautologous, contradictory, and contingent statements. <i>Reading: Hurley & Watson, Ch. 6 (6.3–6.4)</i>	—
Week 7	Oct 6, 8	Testing Validity with Truth Tables and Indirect Truth Tables: Testing argument validity with truth tables; indirect truth tables for multi-variable arguments; identifying inconsistent premise sets. <i>Reading: Hurley & Watson, Ch. 6 (6.5–6.6)</i>	—
Week 8	Oct 15	Natural Deduction: Implicational Rules of Inference: Rules of inference: Modus Ponens, Modus Tollens, Pure Hypothetical Syllogism, Disjunctive Syllogism, Constructive Dilemma (Fall Break week). <i>Reading: Hurley & Watson, Ch. 7 (7.1)</i>	<i>Oct 12–Oct 13: Fall break (no classes). Fri Oct 16: Midterm grades due.</i>
Week 9	Oct 20, 22	Natural Deduction: Equivalence and Replacement Rules: Rules of replacement: De Morgan's laws, commutativity, associativity, distributivity, double negation, contraposition, material implication. <i>Reading: Hurley & Watson, Ch. 7 (7.2–7.4)</i>	—
Week 10	Oct 27, 29	Conditional Proof, Indirect Proof, and Midterm Exam 2: Conditional proof (CP) and indirect proof (IP); subproof notation; discharging assumptions; Midterm Examination 2 in class. <i>Reading: Hurley & Watson, Ch. 7 (7.5–7.7)</i>	Midterm Examination 2 (in class).
Week 11	Nov 3, 5	Introduction to First-Order Predicate Logic: Limitations of propositional logic; symbols of predicate logic, individual constants and variables, predicates, and translating categorical statements. <i>Reading: Hurley & Watson, Ch. 8 (8.1)</i>	<i>Fri Nov 6: Last day to withdraw (W) or elect Pass/No Pass.</i>
Week 12	Nov 10, 12	Quantification and Categorical Translations: Universal and existential quantifiers, translation of overlapping quantifiers, and formalizing the traditional Square of Opposition. <i>Reading: Hurley & Watson, Ch. 8 (8.2–8.3)</i>	—
Week 13	Nov 17, 19	Natural Deduction Proofs with Quantifiers: Universal Instantiation (UI), Universal Generalization (UG), Existential Instantiation (EI), and Existential Generalization (EG) rules and restrictions. <i>Reading: Hurley & Watson, Ch. 8 (8.4)</i>	—
Week 14	Nov 24	Relational Predicates and Multiple Quantifiers: Relational predicates, multiple quantifiers, change of quantifier rules, and conditional proofs in predicate logic (Thanksgiving week). <i>Reading: Hurley & Watson, Ch. 8 (8.5–8.6)</i>	<i>Nov 25–Nov 27: Thanksgiving break (no classes).</i>
Week 15	Dec 1, 3	Applications to Legal and Scientific Reasoning: Applying formal logic to legal arguments (statutory construction, precedent) and scientific confirmation (hypothetico-deductive model). <i>Reading: Supplementary readings on Canvas</i>	—
Week 16	Dec 8	Metatheory and Comprehensive Course Review: Soundness and completeness of formal systems, limitations of	<i>Wed Dec 9: Last day of classes. Thu Dec 10: Reading Day.</i>

Week	Dates	Topics & Readings	Assignments & Deadlines
		formalization, Gödel's theorems overview, and final examination review. <i>Reading: Hurley & Watson, Review</i>	
Finals	Dec 17	Comprehensive Final Examination: Thursday, December 17, 2026, 3:30–5:30 p.m., Lovell Hall 140.	Scheduled during the university final examination period in Lovell Hall 140.

Course Policies

Attendance Policy

Mastery of formal symbolic logic requires active, regular in-class practice and guided proof construction in Lovell Hall 140. Attendance is required at all lecture sessions. If you cannot attend due to illness or official university business, contact Dr. Walsh in advance and review the online proof walkthroughs on Canvas. Students who miss the first two class meetings without notifying the instructor may be dropped. Students may miss class for religious observance without penalty if they notify the instructor in writing within the first two weeks of the semester (by Wednesday, September 9, 2026). Absences for university-sponsored activities (athletics, performances, conferences) are excused with a letter from the sponsoring office at least one week in advance.

Late Work Policy

Weekly formal logic problem sets submitted late lose 10% per calendar day and will not be accepted after three days past the deadline. In-class deduction quizzes cannot be made up unless an excused absence has been approved in writing.

Final Exam Policy

The final examination (Thursday, December 17, 2026, 3:30–5:30 p.m.) is scheduled by the University Registrar and can't be moved without the Dean's written approval (Faculty Handbook §5.5). A student with three or more final exams on the same calendar day may reschedule one of them. Requests go to the instructor of the middle exam by the last day of classes. For this term, send the request by Wednesday, December 9, 2026 (Student Handbook §6.4).

Academic Integrity

Alkimi University is an academic community devoted to rigorous scholarship, open intellectual inquiry, and uncompromising ethical conduct. All students are subject to the regulations of the Alkimi University Academic Integrity Policy. Academic dishonesty—including plagiarism, cheating on examinations, unauthorized collaboration, fabrication of empirical data, and unauthorized submission of academic work generated by artificial intelligence—undermines the integrity of the university and carries severe disciplinary sanctions. Sanctions range from a failing grade on an assignment or exam to an administrative course failure recorded as an 'XF' on the official transcript, academic suspension, or expulsion. Suspected violations are formally investigated and resolved through the Office of Academic Integrity in accordance with Faculty Handbook §6. For detailed information, consult the Office of Academic Integrity, Lovell Hall 315, (555) 555-0163, integrity@university.alkimi.ai.

Accessibility Services

Alkimi University is committed to providing equitable educational access and reasonable accommodations for all students with documented disabilities, including physical, sensory, psychological, learning, and chronic health conditions. Students requesting academic accommodations must formally register with the Office of Accessibility Services, Harlan Hall 204, (555) 555-0155, access@university.alkimi.ai. Once approved, students will receive an official Faculty Accommodation Letter detailing approved accommodations. Students should present this letter to the instructor as early in the semester as possible, and at least one

week prior to any exam or assignment requiring accommodation. Accommodations cannot be applied retroactively.

Student Wellness and Mental Health

Your physical health, psychological well-being, and mental health are essential to your academic success. If you experience heightened stress, anxiety, depressive symptoms, personal trauma, or academic burnout, free, confidential counseling and medical care are available through the Hollis Health & Counseling Center, located in the Hollis Center. Routine appointments are available Monday–Friday 8:00 a.m.–6:00 p.m. and Saturday 10:00 a.m.–2:00 p.m. during the semester by calling (555) 555-0190 or emailing health@university.alkimi.ai. Urgent, 24/7 crisis psychological counseling is accessible immediately at (555) 555-0199.

Campus Student Support Services

- **Academic Advising Center:** Lovell Hall 101 | (555) 555-0158 | advising@university.alkimi.ai
- **Writing Center:** Whitcombe Library 3rd Floor | Free consultations on papers, reports, and research projects at any stage.
- **Whitcombe Library:** Whitcombe Library, Main Floor | (555) 555-0170 | askalibrarian@university.alkimi.ai
- **Hollis Health & Counseling Center:** Hollis Center | (555) 555-0190 | 24/7 Counseling Line: (555) 555-0199 | health@university.alkimi.ai
- **Philosophy & Logic Tutoring Lab:** Lovell Hall 240 | One-on-one peer tutoring for truth table construction, quantifier translation, and natural deduction proofs.