

**PHILOSOPHY 114  
INTRODUCTION TO FORMAL LOGIC I**

**BULLETIN INFORMATION**

PHIL 114 - Introduction to Formal Logic I (3 credit hours)

**Course Description:**

Formal logic, including foundational logical concepts, syntax and semantics of first-order logic; derivations; applications.

**SAMPLE COURSE OVERVIEW**

The subject matter of this course is symbolic logic. We will be studying both propositional logic and first-order quantificational logic. Students will be familiarized with the (artificial) language of first-order logic and introduced to concepts such as validity, logical truth and satisfiability. Several techniques for evaluating arguments that are expressible in the language of first-order logic will be introduced, including a Fitch-style natural deduction system. Some of the concepts and methods studied in this course will be introduced through the use of software that is included with the textbook for this course. No computer skills are presupposed. Students will be given all the instruction they need at the beginning of the semester.

**ITEMIZED LEARNING OUTCOMES**

**Upon successful completion of Philosophy 110, students will be able to:**

1. Apply, as appropriate, principles of analytical reasoning, using as a foundation the knowledge of mathematical, logical, and algorithmic principles
2. Recognize and use connections among mathematical, logical, and algorithmic methods across disciplines
3. Identify and describe problems using formal symbolic methods and assess the appropriateness of these methods for the available data
4. Effectively communicate the results of such analytical reasoning and problem solving
5. Identify the logical structures of ordinary language statements and arguments
6. Use the symbolism of first-order logic to represent those logical structures
7. Explain and apply the logical properties of validity, satisfiability, consistency, logical truth, and logical equivalence
8. Apply deductive techniques for the evaluation of arguments couched in the symbolism of first-order logic

**SAMPLE REQUIRED TEXTS/SUGGESTED READINGS/MATERIALS**

1. Jon Barwise & John Etchemendy, (2002) Language, Proof and Logic, Text/Software Package, CSLI Publications, ISBN: 157586374X.
2. i>clicker remote (available through the University Bookstore, Russell House)

## SAMPLE ASSIGNMENTS AND/OR EXAM

1. **12 weekly homework assignments:** The following is a listing of all the homework assignments for the course. Please note that some weeks there are more homework problems required than others. Also, some assignments may take more time than it would appear from the number of problems, as some problems have multiple parts.

- a. HW1 : Due Friday of Week 2 (13 problems)
  - i. Exercises 1.1 – 1.6, 1.8 – 1.10, 2.1 – 2.4
- b. HW2: Due Friday of Week 3 (8 problems)
  - i. Exercises 1.12 – 1.13, 1.19 – 1.20, 2.7 – 2.10
  - ii.4 extra credit problems: 2.11 – 2.14
- c. HW3: Due Friday of Week 4 (10 problems)
  - i. Exercises 2.15, 2.17 – 2.21, 2.24 – 2.27
- d. HW4: Due Friday of Week 5 (16 problems)
  - i. Exercises 3.1 – 3.3, 3.5 – 3.10, 3.12 – 3.18
- e. HW5: Due Friday of Week 6 (13 problems)
  - i. Exercises 3.20 – 3.24, 4.1 – 4.7, 4.8
- f. HW6: Due Friday of Week 7 (18 problems)
  - i. Exercises 4.12 – 4.18, 4.20 – 4.22, 4.26 – 4.28, 6.1 – 6.5
  - ii.5 extra credit problems: 4.23 – 4.24, 4.29 – 4.30, 6.6
- g. HW7: Due Friday of Week 9 (13 problems)
  - i. Exercises 6.7 – 6.12, 6.21, 6.28 – 6.30, 6.33 – 6.35
  - ii.7 extra credit problems: 6.13 – 6.14, 6.18 – 6.20, 6.31 – 6.32
- h. HW8: Due Friday of Week 10 (10 problems)
  - i. Exercises 7.1 – 7.4, 7.11 – 7.14, 7.18, 7.19
  - ii.5 extra credit problems: 7.5 – 7.8, 7.15
- i. HW9: Due Friday of Week 11 (13 problems)
  - i. Exercises 8.17 – 8.25, 8.34 – 8.37
  - ii.4 extra credit problems: 8.26 – 8.29
- j. HW10: Due Friday of Week 12 (13 problems)
  - i. Exercises 9.1 – 9.6, 9.8 – 9.14
  - ii.3 extra credit problems: 9.18 – 9.20
- k. HW11: Due Friday of Week 13 (9 problems)
  - i. Exercises 9:15 – 9.17, 10.1 – 10.4; 10.8 – 10.9
  - ii.4 extra credit problems: 10.10 – 10.13
- l. HW12: Due Friday of Week 14 (13 problems)
  - i. Exercises 10.20 – 10.22, 13.1 – 13.5, 13.10 – 13.14
- m. 4 extra credit problems: 13.15 – 13.18

2. **Mid-term exam**

3. **Final exam**, cumulative, although with an emphasis on the material covered in class since the mid-term exam.

- 4. Attendance and participation**, based on i>clicker points. i>clicker responses are the way attendance at lectures is monitored and participation points are assigned. To get the participation points for a particular lecture day, you must respond to 80% of the i>clicker questions asked in the lecture for that day.

**SAMPLE COURSE OUTLINE WITH TIMELINE OF TOPICS, READINGS/ASSIGNMENTS, EXAMS/PROJECTS**

- Week 1:** Introduction: What is logic? -Introduction, pp.1-10  
Valid & sound arguments- Chap 2 sec.2.1  
Lab Day: Orientation session – introducing Tarski
- Week 2:** Atomic sentences; General 1st order languages- Chap. 1 sec.1.1 – 1.4  
Lab day  
Homework #1
- Week 3:** Function symbols; FOL of set theory & arithmetic- Chap.1 sec.1.5 – 1.7  
Informal proofs with identity- Chap 2 sec.2.2  
Lab day  
Homework #2
- Week 4:** Formal proofs – introducing Fitch- Chap.2 sec. 2.3 – 2.4  
More formal proofs; Non-consequence- Chap.2 sec. 2.3 – 2.4, 2.5  
Lab day  
Homework #3
- Week 5:** Negation, Conjunction, Disjunction- Chap.3 sec.3.1 – 3.4  
Ambiguity; Equivalence- Chap.3 sec.3.5 – 3.6  
Lab day  
Homework #4
- Week 6:** Translations with Boolean connectives- Chap.3 sec.3.7  
Tautologies & logical truth - introducing Boole- Chap.4 sec.4.1  
Lab day  
Homework #5
- Week 7:** Logical & tautological equivalence- Chap.4 sec.4.2  
Logical & tautological consequence; start proofs- Chap.4 sec.4.3 – 4.4; Chap.6  
  
Lab day  
Homework #6
- Week 8:** Formal proofs with Boolean connectives; exam review- Chap.6 sec.6.1 – 6.3  
  
Mid-term Exam – in class

Mid-term Exam  
Lab day

**Week 9:** Sub-proofs, strategy, logical truth- Chap.6 sec.6.3 – 6.6  
More proofs- Chap.6 sec.6.3 – 6.6  
Lab day  
Homework #7

**Week 10:** Conditionals- Chap.7 sec.7.1 – 7.2  
Translations with conditionals- Chap.7 sec.7.1 – 7.2  
Lab day  
Homework #8

**Week 11:** Formal proofs with conditionals- Chap.8 sec. 8.2  
More proofs- Chap.8 sec.8.2  
Lab day  
Homework #9

**Week 12** Quantifiers- Chap.9 secs.9.1- 9.4  
Simple translations- Chap.9 sec.9.5  
Lab day  
Homework #10

**Week 13:** More translations- Chap.9 sec.9.6  
1st order consequence & equivalence- Chap.10 sec.10.2 – 10.3  
Lab day  
Homework #11

**Week 14:** Proofs with quantifiers- Chap.12 sec.12.1 – 12.3  
More proofs- Chap.13 sec.13.1 – 13.2  
Lab day  
Homework #12

**Week 15:** Last day of classes - review for exam

**Week 16:** Final Exam according to University Exam Schedule