



## East China Normal University International Summer Session

### PHI 21 Introduction to Logic

**Term: July 5 – August 8, 2018**  
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### Course Overview

All human beings reason about the world. We try to take the information we have about the world and to see what else we can on the basis of that information. One way in which we reason is by making deductive arguments. Take the following two arguments as examples:

Argument A:

- (1a) All dogs are mammals.
- (2a) All terriers are dogs.
- Therefore, (3a) All terriers are mammals.

Argument B:

- (1b) All dogs are mammals.
- (2b) Some mammals live in the ocean.
- Therefore, (3b) Some dogs live in the ocean.

If you think about these arguments for a second, you should see that one of them is defective as an argument. There is the problem with Argument B. Even if both (1b) and (2b) are true, it does not *follow* that (3b) is true. On the other hand, argument A seems to be a good argument. It is impossible for it to be the case that (1a) and (1b) are true but (1c) is false.

In the language of philosophers, Argument A is *valid* but Argument B is *invalid*. Logic is the study of what makes an argument valid or invalid, and the goal of the logician is to describe and to understand the rules of correct reasoning. Logicians pursue this goal by studying *formal languages*, which are simplified languages that follow very precise rules.

One aim of this course is for students to become proficient with a certain *formal language*, in this case that of first-order logic or predicate logic. Students will learn how truth functions in this language and how we can be precise about the validity and invalidity of



arguments. They will also learn how to construct formal proofs within this system in what logicians call a *natural deduction system*.

Another goal of the course is for students to learn how to think about the relationship between formal languages and natural languages. First-order logic is able to capture some aspects of a natural language such as English or Chinese and can make clear how some of our arguments work and how some fail to work. On the other hand, there are aspects of natural languages that first-order logic cannot represent. Paying close attention to the relation between formal and natural languages improves our understanding of both. Finally, by studying arguments in such a detailed and precise way, we become better at reasoning in our everyday lives.

### **Course Goals:**

A student who satisfactorily completes this course should:

1. Learn how to represent natural language arguments in a formal system;
2. Master the semantics of propositional logic and first-order logic;
3. Become familiar with natural deduction proofs in propositional logic and first-order logic;
4. Learn about the strengths and weaknesses of formal systems as representations of natural languages; and,
5. Substantially improve his or her critical thinking skills and ability to analyze arguments in any field of study.

### ***Required Texts:***

The text for this course is Paul Teller's *A Modern Formal Logic Primer* which is available for free online at: <http://tellerprimer.ucdavis.edu/>. There will also be additional material provided in class.

### ***Course Hours***

The course has 25 class sessions in total. Each class session is 110 minutes in length, for a total of 2750 minutes of in-class time. The course meets from Monday to Friday. ECNU awards 4 credits for this course. Different universities may count course credits differently. Consult officials at your own home institution.

### ***Attendance***

Summer school is very intensive and to be successful, students need to attend every class.



Occasionally, due to illness or other unavoidable circumstance, a student may need to miss a class. ECNU policy requires a medical certificate to be excused. Any absence may impact on the student's grade. Moreover, **ECNU policy is that a student who has more than 2 absences will fail the course. Arriving late or leaving early will count as an absence.** In addition to attending every class, students will be expected to complete the reading assignments prior to class and to arrive ready to participate in class discussion. I will hold a number of evening review sessions over the course of the semester. Your performance in the class will be greatly aided by attending these review sessions.

### ***Grading Policy***

ECNU awards grades of A, A-, B+, B, B-, C+, C, D, and F. Most colleges and universities do not award transfer credit for grades of D or F.

In this course, grading will be based on the following:

- 30% First and Second Exam (July 13 and July 24)
- 40% Final Exam (August 8)
  - 30% Homework, quizzes, preparation, participation.

### ***General expectations:***

Students are expected to:

Attend all classes and be responsible for all material covered in class and otherwise assigned. Any unexcused absence may impact a student's grade. Moreover, ECNU policy is that a student who has more than 2 absences will fail the course. Arriving late or leaving early will count as a partial absence.

Complete the day's required reading and assignments before class.

Make sure that you bring your book to class every day.

Review the previous day's notes before class; make notes about questions you have about the previous class or the day's reading

Participate in class discussions and complete required written work on time.

Refrain from texting, phoning or engaging in computer activities unrelated to class during class. Students using electronic devices in a way unrelated to class will be asked to leave and will be marked absent. Repeated offenses will result in penalties to your final grade.

Refrain from private conversations during the class period.



### ***Tentative Course Schedule***

The planned schedule sketched out below may be modified to suit the interests or abilities of the enrolled students.

#### **WEEKS ONE and TWO (July 5 – July 13): *Sentence Logic.***

- July 5 (Th): Introduction. The nature of argument. Deductive and inductive arguments.  
Truth, Validity, Soundness, and Consistency.  
Read: Teller Volume I: Preface and Chapter 1
- July 6: (F) Truth Functions. Truth Tables.  
Boolean Logic. Translation and Transcription.  
Read: Teller Volume I Chapters 1 and 2.
- July 9 (M): Tautology and Contradiction.  
Read: Teller Vol. I Chapters 2 and 3.
- July 10 (T): Conditionals.  
Truth Table Tests for Validity and Consistency.  
Truth Trees  
Read: Teller Vol. I Chapters 4 and 8-9
- July 11 (W) Truth Trees for Sentence Logic.  
Read: Teller Vol. I Chapters 8 and 9
- July 12 (Th) In-Class Problem Set Exercise and Review  
Read: No New Readings
- July 13 (F) **First In-Class Exam.**  
Read: No new readings.

#### **WEEK THREE (July 16 – July 20):**

**I will be away on July 16 and 17. We will make up these classes at a time to be announced. You should read Teller Vol. 1 Chapters 5-7 and do the problems assigned. There will be some video tutorials available online as well.**

- July 18 (W): Natural Deduction System for Sentence Logic  
Read: Teller Vol. I Chapter 5
- July 19 (Th): Natural Deduction System for Sentence Logic  
Read: Teller Vol. I Chapter 6



July 20 (F): Natural Deduction System for Sentence Logic  
Read: Teller Vol. I Chapter 7

**WEEK THREE (July 23 - July 27): *Finishing Sentence Logic. Introduction to Predicate Logic***

July 23 (M): Putting it all together and Review for Second Exam  
Read: Review Teller Volume I

July 24 (T): **Second Exam.**

July 25 (W): Predicate Logic Introduced. Syntax and Semantics for Predicate Logic.  
Models and Interpretations in Predicate Logic. Validity and Countermodels.  
Read: Teller Vol. II Chapters 1-3

July 26 (Th) Quantifiers and Natural Language  
Read: Teller Vol. II Chapters 3-4

July 27 (F) Truth Trees in Predicate Logic  
Read: Teller Vol. II Chapters 7-8

**WEEK FOUR and FIVE (July 30 - August 8): *Predicate Logic***

July 30 (M): Truth Trees and Models in Predicate Logic  
Read: Teller Vol. II Chapters 7-8

July 31 (T): Natural Deduction System for Predicate Logic (without identity)  
Read: Teller Vol. II Chapters 5-6

August 1 (W) Natural Deduction System for Predicate Logic (without identity)  
Read: Teller Vol. II Chapters 5-6

August 2 (Th) Natural Deduction System for Predicate Logic (without identity)  
Read: Teller Vol. II Chapters 5-6

August 3 (F) Identity. Functions and Definite Descriptions. The full system of First-Order Logic.  
Read: Teller Vol. II Chapter 8

August 6 (M) Putting it All Together.  
Read: Review Teller Vol. II



August 7 (T) Limitations of First-Order Logic  
Read: No New Readings

August 8 (W) **Final Exam**

### ***Academic Honesty***

Students are expected to maintain high standards of academic honesty. Specifically, unless otherwise directed by the professor, students may not consult other students, books, notes, electronic devices or any other source, on examinations. Failure to abide by this may result in a zero on the examination, or even failure in the course.

Academic communities depend on trust. The worst offense in an academic community is to represent someone else's work as your own, whether it be cut and pasting from the Internet or copying from another student. Philosophy is a cooperative endeavor, and I encourage you to speak with other students, friends and family members about this course. Cooperate, but don't copy! If you ever have any doubt whether what you are doing constitutes cheating, please ask the professor.