Formal Logic I

Fall, 2005

Instructor: Tom Trelogan
tom.trelogan@unco.edu

Office: Smith House (1007 20th St.) Office Hours: 11:15-12:15, MWF*
Office Phone: 351-1561 Home Phone: 353-8253

Course Objectives

The aim of this course and its sequel is to provide a thorough introduction to the basic principles and methods of formal logic. During the first semester, you'll become familiar with (1) the nature of arguments and the basic principles of argument evaluation (which might well be review for some of you), (2) the nature of calculi (or formal systems or logistic systems, as these are also sometimes called), (3) the rationale for the use of formalized artificial languages in the study of deductive logic, (4) the general method of constructing a logistic system (standardly referred to as the logistic method), (5) a propositional calculus, and (6) a formalized language of the sort standardly used for the study of first order logic by means of the logistic method. During the second semester you'll learn how the formalized language introduced toward the end of the first semester can be made into a full-blown logical calculus—a predicate calculus—by means of the addition of a system of inference rules for first order logic, and how a metatheory can then be developed for the logical calculus that results. A study of systems of first-order logic with identity and terms and their use in constructing formalized theories will round out the second semester.

While formal logic used to be required of philosophy majors at UNC, it no longer is, and the requirement can be waived for anyone still under an edition of the *Catalog* in which it is required.

Texts

The main text for this semester and next—Mates's *Elementary Logic*—is available at The Book Stop and, perhaps, at the Barnes and Noble in the UC as well. *Basic Symbolic Skills* is available in the form of a .pdf file at http://www.unco.edu/philosophy/current/240-007.html.

Mates, Benson. *Elementary Logic*. 2nd ed. New York: Oxford UP, 1972.
Trelogan, Thomas K. *Basic Symbolic Skills*. 2nd ed. Greeley, CO, 1994.

Assignments

There will be regular homework assignments, a variety of quizzes, two midterm examinations (on Sept. 30 and Oct. 28), and a comprehensive final examination (on Thursday, Dec. 8, from 1:30 to 4:00 p.m.).

Your grade for the course will be determined by your performance on the homework, on the quizzes, and on the three examinations. Your performance on the homework will be worth 30% of your final grade, your performance on the quizzes will be worth 10%, and your performance on each of the examinations will be worth 20% of your final grade. The scale I use to determine letter grades is the standard scale: 90–100 = A; 80–89 = B; 70–79 = C; 60–69 = D; 0–59 = F. I do not curve grades. Extra credit options, however, will be available, and I reserve the right under certain circumstances to assign grades higher than the ones earned by way of semester averages—to students, for example, who have shown marked improvement during the course of the semester.

To receive credit for the course, you must complete all work assigned (except for quizzes; you'll not be allowed to make up missed quizzes, which will be recorded as zeros—the moral: make sure you don't miss the quizzes). The penalty for late submission of homework will be a recorded grade of zero for each late assignment—which you will still have to complete in any case in order to receive credit for the course. Extensions will be given on homework assignments only in the most extraordinary of circumstances.

The penalty for plagiarism on the homework assignments or for cheating on the quizzes or examinations will be denial of credit for the entire course.

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* And, of course, by appointment.

What It'll Take to Pass This Course

What it will take to pass this course is good old hard work. You'll have to memorize and learn to apply a great many definitions and rules—not just get the gist or general drift of them, but grasp them with great precision—and, in addition, you'll have to master a sizable number of techniques for the production of calculations in the calculi we'll be studying this semester. If you're diligent about doing both these things throughout the term, the reward will be the joy of being able to work in the calculi we study and of being able to really understand all our discussions of them. If you fail to do them, the punishment will be the pain of ineffectuality and incomprehension. So complete all the reading assignments on time, making sure you cover the material really thoroughly and commit to memory as soon as you encounter them all the rules and definitions the assignments contain, and do the homework carefully and without fail: it'll give you the practice you'll need to master both the techniques of calculation you'll be learning and the application of all those definitions and rules. If you do both these things assiduously, you're almost sure to do just fine in this course. But you are going to find that the work required to do all this is both hard and time-consuming. The fact is that formal logic stands to philosophy roughly as organic chemistry stands to chemistry: it's a challenge. Arrange your life accordingly.

Availability of Help

This is a course in which you can't afford to fall behind. I'm more than willing to help you master all the things you'll need to learn, so as soon as you think you need any help, let me know. Come see me during my office hours or post questions to the class's discussion forum *via* our Web site at http://www.unco.edu/philosophy/current/240-007.html.

WFF'N PROOF: The Game of Modern Logic

The most complicated calculus you'll work with extensively this semester is a propositional (or sentential) calculus—a calculus that can be used to determine for any proposition (or sentence) (1) whether or not it's a tautology (i.e., a logical truth of a certain sort), and (2) whether or not it's a tautological consequence (i.e., a certain kind of *logical* consequence) of any given set of premises. (If you have no idea at all of what this means, don't worry: if you already knew what it meant, there'd be no point in your taking the course.) A good way to get practice in working with this calculus is by playing a game—the game of WFF'N PROOF—and so during the course of the semester, I'll teach you how to play it. Starting the third full week of the semester, I'll hold regular weekly WFF'N PROOF sessions. These won't be optional sessions; attendance at them is mandatory. Why? Well, because really good WFF'N PROOF players are invariably really good at constructing calculations in the propositional calculus we'll be studying, and that's one of the main things I want you to be really good at by the end of the semester.

Logic Software: *The Logic Stacks*

I'll also familiarize you with a piece of logic software called *The Logic Stacks* that will enable you to hone a number of essential skills related to the use of the same calculus that the game of WFF'N PROOF is designed to teach—the propositional calculus mentioned in the preceding paragraph—as well as a number of essential skills related to the use of several different extensions of that calculus that we'll eventually be looking at. The chief virtue of *The Logic Stacks* is that the software can provide you with immediate information about whether you're doing things correctly or not. You do, of course, get the same information by way of corrections on your homework, but not nearly so quickly—after all, there's an interval of from 48 to 120 hours between one meeting of the class and the next—and besides: once you find out that you've made mistakes on your homework, you'll already have been docked the relevant points. *The Logic Stacks* give you a way of checking your homework for correctness yourself—*before* you turn it in. Last but not least: the on-line help file in the *Stacks* contains lots of useful pointers about how to do things you're going to need to become proficient at this term.

The Logic Stacks will be available in the logic lab in the basement of Smith House.

Course Outline

Although the following outline is not etched in stone, I plan to do my best to follow it.

Aug.	M	22	Preliminaries on Arguments and the Evaluation of Arguments.	
	W	24	More on the Same Subject: Definitions of Basic Terms and Strategies for Assessing Arguments.	
	F	26	More on Argument Assessment. Additional Explanations and Examples.	
	M	29	The Subject of the Course: Logic in General; Deductive Logic in Particular.	*Add Deadline*
	W	31	*Elementary Logic,* Chapter 1, §§1-3. Deductive Logic as the Study of the Consequence Relation.	
Sept.	F	2	*EL,* Chapter 1, §4. Truth and the "Bearers" of Truth.	*Drop Deadline*
	M	5	*No class*	*Labor Day;*
	W	7	*EL,* Chapter 1, §§5-6. Formal Logic and Logical Form.	
	F	9	Formal Logic and the Logistic Method.	
	M	12	*Basic Symbolic Skills,* front matter, Chapter I, §§1-2. Symbols, Symbol-Arrays, and Derivation.	
	W	14	*BSS,* Chapter I, §§3-4. Calculi and Games. An Example: System T.	
	F	16	—	
	M	19	*BSS,* Chapter I, §5A. Use, Mention, and Display.	
	W	21	*BSS,* Chapter I, §5B. Variables, Matrices, and Quantifiers.	
	F	23	—	
	M	26	*BSS,* Chapter I, §6. More Sample Calculi: Systems W and W´.	
	W	28	—	
	F	30	Test.	*First Midterm*
Oct.	M	3	*BSS,* Chapter II, §1-2. Logic and Artificial Languages.	
	W	5	*BSS,* Chapter II, §3-4. The Syntax and Semantics of Artificial Languages. An Example: L_I.	
	F	7	—	
	M	10	*BSS,* Chapter II, §5. Interpretations of L_I.	
	W	12	*BSS,* Chapter II, §6. Sets—A First Look.	
	F	14	—	*Withdrawal Deadline*
	M	17	*BSS,* Chapter II, §7. Final Statement of the Semantic Rules for L_I.	
	W	19	*BSS,* Chapter II, §8. Logical Truth and Logical Consequence in L_I.	
	F	21	—	
	M	24	Review.	
	W	26	—	
	F	28	Test.	*Second Midterm*
	M	31	*BSS,* Chapter III, §1-2. The Logistic Method. Example: Constructing a Deductive Apparatus for L_I.	
Nov.	W	2	*BSS,* Chapter III, §3. The New System: System I.	
	F	4	—	
	M	7	*EL,* Chapter 3, A Formalized Language for the Study of First-Order Logic. Mates's $\mathfrak{L}$ and its Syntax.	
	W	9	*EL,* Chapter 4, §§1-2. The Semantics of $\mathfrak{L}$: Interpretations of $\mathfrak{L}$ and Truth under an Interpretation.	
	F	11	—	
	M	14	*EL,* Chapter 2, §5. More on the Semantics of $\mathfrak{L}$ and More on Sets.	
	W	16	*EL,* Chapter 4, §§3. Still More on Semantics: Consistency, Consequence, and Logical Truth.	
	F	18	*EL,* Chapter 5, §1. English, $\mathfrak{L}$, and the Question of Translatability. Introductory Reflections.	
	M	21	*EL,* Chapter 2, §§2-4; Chapter 5, §2. Extensionality and Non-Extensional Contexts.	
	W	23	Translation Relative to Interpretations and to Interpretations Given in Various Ways.	
	F	25	*no class*	*Thanksgiving Vacation*
	M	28	More on Translating English into $\mathfrak{L}$.	
	W	30	Still More on Translating English into $\mathfrak{L}$.	
Dec.	F	2	Derivation Rules for First-Order Logic? One Way: We Can Use What We've Got: System WHY?	
	Th	8	Final Exam: 1:30-4:00	Final Examination

Accommodations for Students with Disabilities

Students who believe that they may need accommodations in this class are encouraged to contact Disability Support Services by dropping by the office in Harrison Hall 159A or by phoning the office at (970) 351-2289 as soon as possible to ensure that accommodations can be arranged in a timely way.