

PHIL C 110 05

Introduction to Logic I

An Independent Learning Course

Course Developer and Instructor:

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IMPORTANT INFORMATION

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The University of South Carolina

WHERE TO GET HELP

For information concerning this and other independent learning courses please call:

1-800-922-2577
(nationwide)

803-777-7210
(if outside the U.S.)

If you would prefer to write or visit, the address is:
Independent Learning
University of South Carolina
Columbia SC 29208

COURSE SUMMARY

Course Number: PHIL C 110 (05)
Course Title: Introduction to Logic I
Instructor: Dr. Henry Cribbs
Credit Hours: 3.0
Prerequisite: None
Assignments: 16 (50% of final grade)
Exams: 2 (midterm exam: 20% of final grade, final exam: 30% of final grade)

NOTE: YOU MUST PASS THE FINAL EXAM TO RECEIVE CREDIT FOR THIS COURSE

Required Text

Jon Barwise & John Etchemendy, *Language, Proof & Logic*. New York: CSLI, 1999.
(The software which is included with the textbook is also required.)

Course Description

An examination of the nature of arguments, including fallacies, and the criteria and techniques of valid deductive inference.

Ordering Course Materials

In order for you to complete this course, you must purchase the course materials listed in the syllabus. Distance Education can only guarantee availability if you order your course materials within two weeks after you receive your course syllabus.

Most textbooks can be ordered from MBS Direct online or using their toll-free telephone number. Some materials are only available through Distance Education. A couple courses require purchases from both Distance Education and MBS Direct. To determine where you should order course materials, visit this Web page.

www.sc.edu/deis/ss/college/cil-materials-info.htm

Scroll down and find your course on that page. Click on the X(s) next to that course for information about required course materials.

If you do not have access to the Web, please contact Distance Education for more information about course materials.

E-mail: question@gwm.sc.edu

Local Telephone: 803-777-7210

Toll-Free Telephone: 800-922-2577

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Meet Your Instructor

Greetings! And welcome to Philosophy 110!

I am Dr. Henry Cribbs, the developer of this course, and also your instructor. Here I will take the opportunity to tell you a little bit about myself, since you don't get to meet me in person in the classroom. (You will have an opportunity to tell me something about yourself as part of your first lesson assignment.)

I have been teaching philosophy for over thirteen years, the majority of which have been at the University of South Carolina, where I have taught both in the classroom and through distance education. I have had the privilege of administering USC's independent learning logic course since 1999. Other institutions at which I have taught include Washington University, Webster University, South Carolina Honors College, and Midlands Technical College. My formal education includes a B.A. from the University of Alabama in 1990, an M.A. from Washington University in 1995, and a graduate engineering certificate in Artificial Intelligence.

Why a New Edition?

The previous version of this independent study course, which I administered for seven years, was originally developed by Professor Roger Sullivan, to whom I owe a great deal for laying the groundwork for the course. However, like many things in this New Millennium, the old version of the course has become obsolete, for several reasons. First, the textbook it used underwent so many updates that the original study guide developed by Prof. Sullivan no longer fit with the currently available edition. Second, the company which provided the computer program used for completing the assignments no longer makes the software. And third, the method of turning in assignments used in the previous version required mailing floppy disks through postal mail. In the current age it is difficult to find a newer computer which can even read floppy disks, and even if you could, mailing the disk back-and-forth is abysmally slow compared to email.

This course update corrects all three of these difficulties. I have selected a different textbook, *Language, Proof and Logic*, which is currently in use in many of the philosophy classrooms at USC. The software for the course is fully integrated and packaged with the textbook, instead of having to be ordered separately from a different publisher, which ensures that the software will stay current with the textbook. I have also designed the course to make full use of USC's existing information technology, including electronic submission of assignments and Blackboard web-based course management software. This will make it easier to keep the course material updated any time the textbook undergoes revision.

I hope you find this new version of the course makes learning logic easier and more convenient!

PHIL C 110 INTRODUCTION TO LOGIC I

COURSE INFORMATION

Philosophy 110 is offered by the Department of Philosophy as a freshman level course as part of a two-course sequence with PHIL 111 (Introduction to Logic II). Although the two courses are numbered I and II, they need not be taken in order. Phil 110 concerns Deductive Logic, while PHIL 111 concerns Inductive Logic. Both types of logic are useful and necessary to evaluate claims made in virtually all of the arts and sciences, as well as in everyday life.

This course fulfills part of the core requirements for many majors at USC. You are strongly advised to consult your advisor and the most recent University Bulletin to verify whether this course will in fact fulfill a core requirement for your particular degree program.

Course Goals: During this course, students will become familiar with the language of propositional logic (also called sentential logic) and first-order quantificational logic (also called predicate logic). Students will understand logical concepts such as validity, logical truth, and logical consequence, and will learn various techniques for analyzing and evaluating formal arguments, including Boolean truth tables and Fitch-style natural deduction. Students will use formal symbolic logic to construct, analyze and evaluate deductive arguments, and in so doing will develop the ability to resolve complex deductive problems.

Prerequisites: There are (at least at the time of this writing) no prerequisites that are required to enroll in this course. However, because this course is administered electronically, it presupposes you have a certain basic degree of computer literacy. You should know how to install and run computer programs, you should know how to use a web browser and email, and you should know how to create, save, find, open, and copy files. You should also be comfortable enough with a computer that you can learn to use unfamiliar (but fairly user-friendly) computer applications. (A user's manual is provided with the software.) You should have an email account (which all USC students automatically have), and you will need access to a computer which is connected to the Internet.

Number of assignments: Sixteen (16).

Examinations: Two (1 midterm and 1 final).

Required Course Materials:

You will need a NEW (not used) copy of the textbook, *Language, Proof and Logic* by Barwise and Etchemendy, published 1999 by CSLI Publications (ISBN 1-889119-08-3). You will also need the suite of software programs included with the textbook. You can purchase the book and software online from the textbook website (<http://www-csli.stanford.edu/LPL/>). You will also need access to a computer with Internet capability.

It is important to obtain a NEW copy of the textbook, since each textbook comes with a unique Book ID#. You will need this number to use the Submit program to turn in your lesson assignments. If you purchase a used textbook, it may well be the case that someone else already used that Book ID# when they ran the software. If that is the case, you will not be able to use that same Book ID# when you run the software. Each student requires his or her own unique Book ID# to use the software, so ***be sure to purchase a NEW textbook!***

Course Outline:

Lesson 1: Introduction to Language, Proof & Logic
Lesson 2: Atomic Sentences
Lesson 3: The Logic of Atomic Sentences
Lesson 4: Boolean Connectives - Negation & Conjunction
Lesson 5: Boolean Connectives - Disjunction
Lesson 6: The Logic of Boolean Connectives
Lesson 7: Proofs – Conjunction & Disjunction
Lesson 8: Proofs – Negation & Contradiction
Lesson 9: Conditionals
Lesson 10: The Logic of Conditionals
Midterm Exam (20% of grade)
Lesson 11: Introduction to Quantification
Lesson 12: The Logic of Quantifiers
Lesson 13: Multiple Quantifiers
Lesson 14: Methods of Proof for Quantifiers
Lesson 15: Formal Proofs & Quantifiers
Lesson 16: More about Quantification
Cumulative Final Exam (30% of grade; must pass final to pass course)

Method of Grading: Grades in this course will be assigned according to the following scheme:

A	90 and above
B+	86-89
B	80-85
C+	76-79
C	70-75
D+	66-69
D	60-65
F	59 and below

The average (mean) of the sixteen lesson assignments will count for 50% of the grade. The midterm exam will count 20%, and the final cumulative exam will count 30%. I will round to the nearest whole number before determining letter grades. Note that it is the policy of USC's independent learning program that if a student fails a final examination, he or she receives a failing grade for the course. *This means that even if your other grades would give you an overall course average of 60 or higher, you will still fail the course if you make less than 60 on the final.*

Grading of Lesson Assignments:

(This explanation will make more sense after you start doing the exercises.)

Each lesson can earn up to 100 points. Each file assigned for that lesson will be counted equally by dividing the 100 points by the number of files, rounding up to the nearest $\frac{1}{2}$ point, to get a specific number of points for each file. (This rounding up means your actual total could be more than 100, but the maximum grade that officially will be recorded for each lesson is 100.)

For example, there is one file to submit for Lesson 1, so it's the whole 100 points. You either get a zero or 100. (But don't panic! That one's easy.)

As another example, in Lesson 2, there are nine files to be submitted (counting the typewritten table for Exercise 1.7 as an additional file), so each file is worth $11\frac{1}{2}$ points. ($100/9=11.111$, which rounds up to the nearest $\frac{1}{2}$ point.) If you get all nine files completely correct, you earn 103.5 points. (Only 100 would be recorded, however, but the extra rounding does mean that even if you only get 8 files correct you still have a 92, so those bonus rounding points *do* help out!)

World files for Tarski's World, Table files for Boole, and Proof files for Fitch are all-or-nothing files. That means that if one thing is wrong in one of these types of files, then you get no points for the file.

Sentence files for Tarski's World are the only kinds of files which can earn partial credit. The number of correct sentences will be divided by the total number of sentences that are supposed to be in the file, to get a fraction of correct answers. That fraction will be multiplied by the number of points the file is worth, and result will be rounded up to the nearest $\frac{1}{2}$ point.

For example, the file submitted for Exercise 1.2 is worth $11\frac{1}{2}$ points (because every file in that lesson is worth $11\frac{1}{2}$ points). The file should have 10 correct sentences. If you get only 7 correct, that's $7/10$ of them, so you get $7/10$ of the $11\frac{1}{2}$ points, rounded up. Since $7/10 \times 11.5 = 8.05$, (which rounds up to 8.5, the nearest half point), you get $8\frac{1}{2}$ points. Get it?

Some exercises require you to submit typewritten portions in the "text message" part of your submission. (For example, Exercise 1.7 asks you to type in a table.) These typewritten messages are treated as additional files for grading purposes. Typewritten portions can sometimes earn partial credit and sometimes are all-or-nothing, depending on the type of written assignment. (This will usually be specified in the lesson.)

Some exercises require you to submit two files at the same time, because it is not possible to grade them separately. (For example, Exercise 1.6 requires you to submit two different World files in order to compare them to each other.) In such cases, failing to submit one of the files for a given exercise may earn a zero for both of them. So make sure you turn in all your files!

Special Notes on Using Grade Grinder:

You should NOT submit exercises to the instructor until you are absolutely sure you are ready for them to be graded, as I generally do not allow “do-overs.” Also, when you are finally ready to submit your lesson exercises to the instructor, please be sure to submit ALL the files for the lesson at once. Do NOT send exercises from a lesson to me one at a time, or even just a few at a time. I will only grade the *first* set of submissions I receive for each lesson.

Note that you can submit assignments just to Grade Grinder without submitting them to your instructor, so that the feedback comes back just to you. This is sometimes useful in order to check whether you got the assignment correct before submitting it officially to me. If there are errors, Grade Grinder will send you a report with hints about what may be wrong with your submission, so you can try to fix it. Once you have all your assignments for a lesson as good as you can get them (which I hope is 100% correct), submit them again, but make sure to check the box that sends them to the instructor on your final submission.

Also note that Grade Grinder is only a computer, so its “hints” may not always be easy to understand. (Grade Grinder doesn’t have much practice at conversation in any language other than FOL.) Usually, however, Grade Grinder will at least let you know what’s incorrect.

Do realize that occasionally (but not often) Grade Grinder will not tell you that you have something wrong. Usually this occurs because telling you would give away the right answer. For instance, in Exercise 1.7 you are supposed to decide whether or not it is possible to write sentences that fit certain logical requirements. If it is possible, you are supposed to write the sentence. If it is not possible, you are supposed to leave the line blank. If you leave it blank when it is possible to write a sentence, Grade Grinder will not tell you that you were not supposed to leave it blank, because that would give away too much of the answer. If you write a sentence when you were supposed to leave it blank, Grade Grinder will tell you the sentence does not meet the requirements, but will not tell you whether or not there should be a sentence there at all. So there are some things you have to figure out for yourself. So be aware that in some rare cases Grade Grinder might not report any errors, even though you got something wrong. Grade Grinder is there to help, not to give you all the answers.

Plagiarism Policy:

Do all of your own work! Do not plagiarize! Plagiarism is the act of putting forward someone else’s work as your own, and is a form of cheating. Grade Grinder can detect whether or not a file has ever been submitted by someone else besides you. If you submit a copy of a file which has been previously submitted by someone else, you will receive a zero for that file. If you do so a second time, you will earn a zero for the whole lesson in which the offense occurs. If you do so a third time, you will earn a zero for the entire course and will be reported to the university administration for academic dishonesty.

If you use a publicly accessible computer, be sure to save all of your own work onto your own disk or memory stick, and erase all copies of your files off of the public computer drive before leaving, so no one else can submit your files as their own.

Recommended Study Procedures

Know your resources: Before beginning each lesson, look on the Blackboard course website (<http://blackboard.sc.edu>) to see if there has been additional supporting material added to help you with the lesson. You should also look on the *Language, Proof and Logic* website (<http://www-csli.stanford.edu/LPL/>) to see if there are any hints and sample solutions which may be of use in the lesson. *But don't read the sample solutions and hints yet! Try to do the exercises without them, but you should be aware that the help is there just in case you need it.*

Practice as you read: You should work through the exercises as you read through the textbook, instead of reading through an entire lesson at a time and then going back and doing the lesson assignments all at once. Attempting the exercises as you go (including the “You Try It” exercises) will give you practice as you proceed, and will both enable you to remember the material better, and give you ongoing feedback, so that you can tell if you are confused about any of the material and perhaps need to spend more time on it. This course is not just a content-based course, requiring knowledge of terms and concepts of logic. It is also a skills-based course, so practicing these logical skills is necessary in addition to reading the material.

Master as you go: You should not proceed to the next lesson until you have mastered the previous one. In this course, later concepts build on earlier ones, so you should make sure you clearly understand each section before proceeding. If you try to go too fast, you will find yourself confused. Take your time. The gray “Remember” boxes within the text provide summaries of some of the most important points. Be sure that these make sense to you after you have completed the lesson. If you have trouble with several exercises in a lesson, that should be a clue to go back and review the lesson and retry the exercises before moving on.

Doublecheck your work: Before submitting the material to me, you should check your work, both within the exercise programs (Tarski's World, Fitch, and Boole) and by getting feedback from Grade Grinder. Each of the three exercise programs has ways of checking your answers. In Tarski's World you can use the Sentence Inspector to make sure the sentences have the truth values you expect. In Boole you can use the Verify options to make sure your truth table and assessment are correct. In Fitch you can use Verify Proof to make sure your proof is valid and that you have reached the goal.

Once you have verified your answers to an exercise within Fitch, Boole, or Tarski's World, you can then submit the exercise to Grade Grinder for feedback using the Submit program. Before submitting an exercise to the instructor, you should submit it just to yourself first for feedback. To do this, you should NOT check the box that sends it to the instructor. Grade Grinder will then send you an email report on your submission, and can tell you if you have successfully completed the exercise. If something is wrong, Grade Grinder will often be able to give you some hints as to how to correct your exercise.

Only after all of your lesson assignments are as correct as you can make them should you submit them to the instructor. Then be sure to submit all of the files for that lesson to the instructor in one big batch, instead of one at a time.

Save your progress: You should always save copies of your exercise files (and save a backup on another device in case something happens to your main memory). Also save copies of your emails from Grade Grinder. If for some reason there is ever a question about whether you turned in an assignment, you can use the emails and original exercise files as a way to verify that you did. (It is always a good idea in any class to save copies of all your work, at least until you receive your final grade.)

Don't use the computer as a crutch: Be careful not to become too dependent upon the computer programs. They can be extremely useful at providing feedback and letting you know if you have an exercise correct before you turn it in. However, because the programs provide instant feedback it is easy to use the programs as a crutch. Just as injured leg muscles will remain weak if you always walk with a crutch, your "logic muscles" will remain weak if you always let the computer do the work for you.

The WRONG way to use the programs is this: Keep trying an exercise over and over using trial and error by randomly moving blocks around (in Tarski's World), or changing the T's and F's around (in Boole), or by trying different inferences (in Fitch), and keep checking your answers until the program tells you that you have it right. You'll get the points for the lesson, to be sure, but you won't have learned how to actually do the exercises on your own. All you will have learned is how to succeed by trial and error. And that won't help you succeed on the exams.

Remember that on the midterm and final exams, you won't have the benefit of the computer programs, and you won't have the benefit of trial and error. Your first answer will be your final answer. So you want to practice the exercises in such a way that you learn how to get the right answer on your first try, without the aid of the computer.

The RIGHT way to use the programs is this: First think through each exercise yourself, and try to write the solution out with pencil and paper. (After all, the exams will be pencil and paper, so you need to practice doing problems without a computer.) Then doublecheck your own answer by hand (the way you would on an exam), and be sure that, as far as you know, it is correct. After you have done the best you can without the computer program, you should enter your answer into the computer program (Tarski's World, Boole, or Fitch) and verify that it works. If it does, get feedback from Grade Grinder to be absolutely sure you have it right, and only then turn it in to the instructor.

However, if the software tells you something is wrong, go back and think about the problem again. First make sure there are no typographical errors or careless mistakes. (Computers can be very picky about things like that. So can logicians.) Then look at the problem again and try to figure out what went wrong. Don't just start making random changes and using the computer to check every change until you happen upon the right answer. Think. Where did you go wrong? How can you fix it? Go back and reread the chapter if you are confused about any of the concepts, or look at some of the hints which might be found on either website. But put as much work into figuring it out yourself as you can.

You should also make a note in the textbook margin by each exercise which you fail to get right the first time. The very exercises which you had problems with the first time around are the very problems you should go back and review before the exam. You should also use the number of exercises you get wrong the first time around as a gauge for whether you should go back and redo the lesson. If you are missing more than 30% of the problems the first time around, you should review the lesson and try them all over again. Don't proceed to the next

lesson until you are confident that you can perform well on pencil and paper without computer feedback.

Work at your own pace: This is an independent study course, so you don't have to follow anyone's schedule but your own. While the course is designed to complete about one lesson a week in a normal semester, don't feel obligated to stick to that schedule. If you find one lesson easy to zip right through in a day and you feel as if you have already mastered the material, submit your assignment and move on. If you are having difficulty mastering a lesson, spend the extra time on it to reread the chapter, practice with the software, receive feedback on your early attempts and work through them again. You should only move on to the next lesson if you feel comfortable with the material you have already covered. This is especially important in a course like logic, where later material builds upon earlier material.

Taking logic as an independent study course has certain advantages over taking it in a regular course setting, and it is worth taking some time here to explain why. Some people can grasp logic almost instantly – it just “clicks” in their heads. For these people the concepts and procedures of logic make perfect sense after the first reading, and they can whip through the exercises in no time. For others, however, it takes more time – it doesn't just “click” right at first. It takes reading and rereading, repetitive practice, and going through the prescribed motions by rote, step by step. These students may not even understand at first exactly why the procedures work, but are still able to get through on sheer persistence and perspiration.

This doesn't mean those who find logic easy are any “smarter” than those who do not. It has more to do with the different ways in which people naturally think, like the right-brain/left-brain division which used to be touted by psychologists and neurologists (though nowadays the explanations for the differences are not quite as simple as “left” and “right”). Some people seem to be just better at logical thinking and the use of symbols, while other people seem to be better at other things, like pattern recognition, spatial orientation, or creativity, than the more “logical” people. If students are not used to working with symbols, it simply takes more time and practice. Eventually, given enough time and practice, it “clicks” for these other students as well.

A typical logic classroom setting, where everyone operates on the same schedule and has to take the exam at the same time at the end of the semester, doesn't take into account these differences among students. Those for whom logic comes easy may become bored early on, while those for whom it is more difficult may struggle the whole semester. This effect is exacerbated by the fact that logic builds upon itself. Since later material presupposes mastery of the earlier material, those who fall behind early in the course may find it very difficult to catch up with the rest of the class when working on a set schedule. The material may not even “click” for some students until exam week rolls around (or even afterwards).

This effect is what often produces what statisticians call a “bimodal curve” in logic classes (and in other classes which rely heavily on symbol manipulation, such as calculus). One typically finds lots of students with very high grades and lots of students with very low grades, but not many students in the middle. The students with high grades are the ones for whom the ideas “clicked” early on. For those with low grades it “clicked” later (or maybe not even yet).

The beauty of the independent study method is that you proceed at your own pace. Those for whom it just “clicks” can work right through. Those who need more time and practice can take as much time as they need.

You should thus be glad that you have chosen to take logic as an independent study course. There is less pressure to finish in a specific amount of time, so you will have time to practice until you have mastered the knowledge and skills that you need. You can do it!

Other Textbooks: Some students may want to consult additional textbooks as extra study aids. You are welcome to read other books in addition to *Language, Proof and Logic*, but I should caution you that it might be confusing to use different textbooks. Although logic itself is universal, there are different styles of logic systems. Some textbooks use different symbols and different rules to accomplish the same thing. (It's a bit like using two different languages to say the same thing.) The end result is the same – a symbolic system which can be used to construct, analyze, and evaluate arguments, but the systems themselves may differ greatly. (For example, Hurley's *Concise Introduction to Logic* is used at USC by some professors, but a quick glance at the inside cover shows you that its symbols and rules are very different from that used by LPL.) If you do use another textbook (or if you have taken a logic class before which used a different textbook), the differences may cause you difficulty. (It would be a bit like trying to learn two different languages at once.) Many of the chapters in *Language, Proof and Logic* contain sections on various alternative symbols that other textbooks use, which can help relieve some of the confusion. These sections are optional for this course. You may find them helpful if you are also using another book (or if you have taken the class before with a different textbook).

The Logic Lab: Another resource which may be available to those students who have easy access to USC's Columbia campus is the Logic Lab. The Department of Philosophy maintains a Logic Lab which is open most days during the regular school year. It is staffed by faculty and graduate students, all of whom are well-versed in deductive logic, and many of whom are familiar with *Language, Proof and Logic* and its software programs. You can use the computers in the Logic Lab (which usually have the LPL programs already installed), and you can ask the Logic Lab staff for help if you are having difficulties with any of the material. For information on the location and hours of the Logic Lab (which change from semester to semester), you should contact the Philosophy Department at 803-777-4166.